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AMERICAN GEOLOGICAL SERVICES, INC.

Environmental, Geological, and Natural Resource Consultants

Final Hydrogeologic Report

Wellington-Oro Mine and Mill Site

French Gulch

Near Breckenridge, Colorado

May 1999

Figures
Volume 2

Prepared for:

U.S. Bureau of Reclamation

Prepared by:

American Geological Services, Inc.

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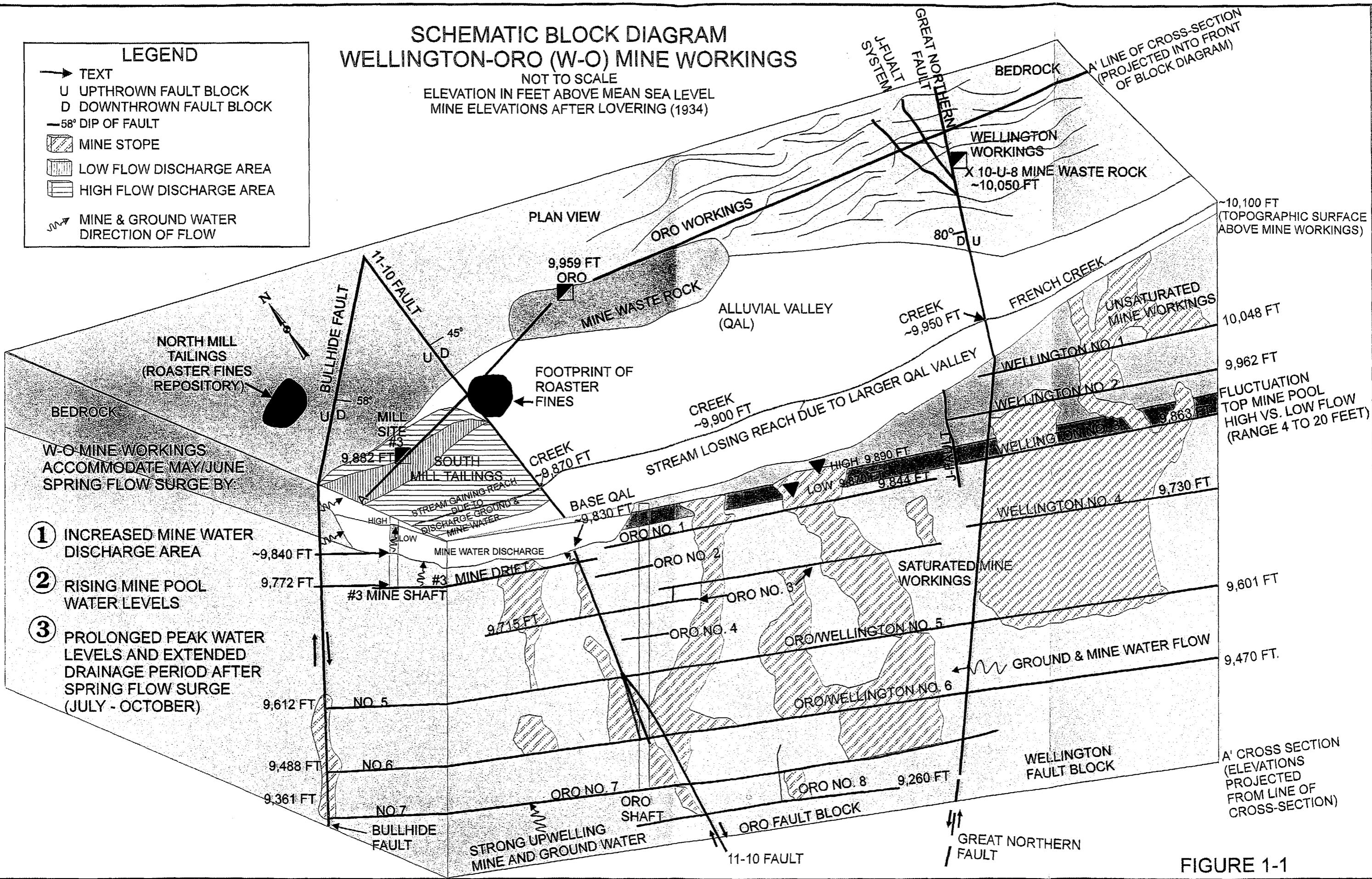
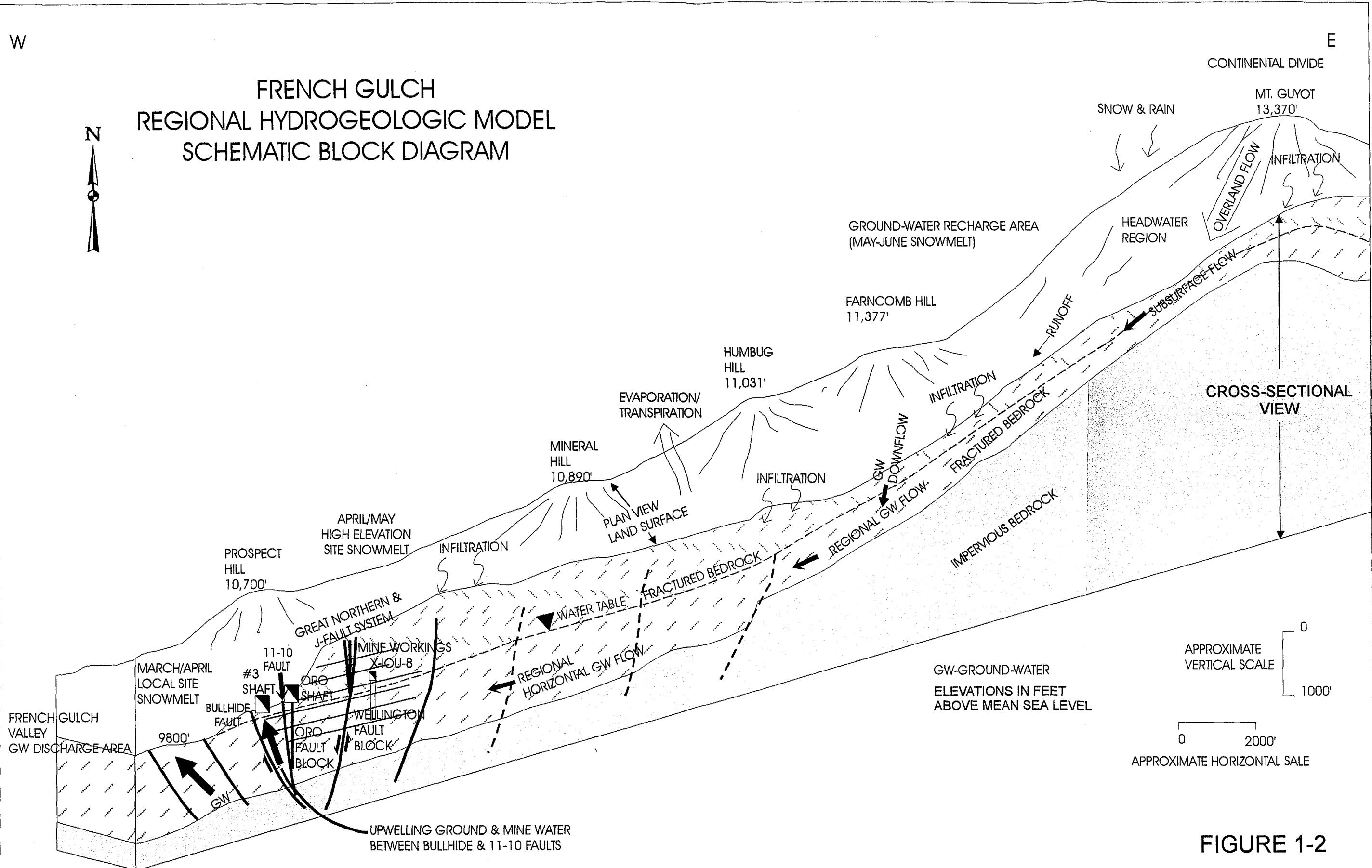


FIGURE 1-1



SW CONTAMINATED
ALLUVIAL GROUND-WATER
DISCHARGES TO
FRENCH CREEK
VIA DOWNGRADIENT
SEEPS & SUBSURFACE FLOW

Downgradient
Western Portion Mine Workings
MSRW-3 #3 SHAFT

MINE OUTFLOW ACCOUNTS FOR
>90% METAL LOADING TO FRENCH CREEK
AVG. HIGH FLOW 600 GPM
AVG. LOW FLOW 145 GPM

MINE & GROUND WATER
DISCHARGE
TO ALLUVIUM VIA
STOPEs, FAULTs
& FRACTURED BEDROCK

ORO LEVEL (1)

ORO LEVEL (2)

ORO LEVEL (3)

ORO LEVEL (4)

ORO LEVEL (5)

ORO LEVEL (6)

ORO LEVEL (7)

BEDROCK

STOPE

11-10
FAULT

STRONG UPWELLING
MINE & GROUND WATER

STOPE

GROUND-WATER
RECHARGES
MINE POOL
VIA FAULTs &
FRACTURED
BEDROCK

STRONG
HORIZONTAL FLOW

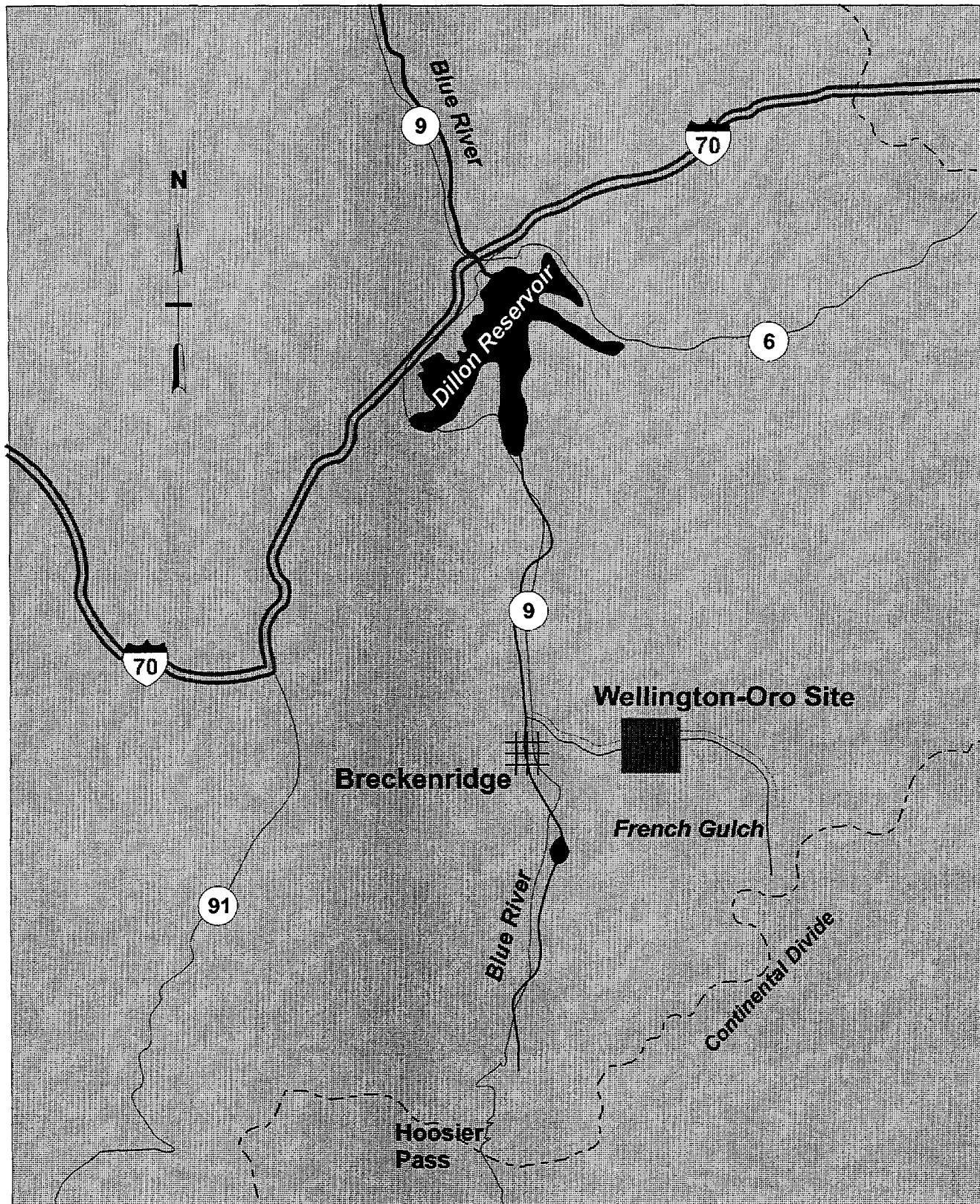
GW
FLOW

SCHEMATIC MINE WATER OUTFLOW MODEL WELLINGTON-ORO

DRAFTED BY AMERICAN GEOLOGICAL SERVICES, INC
AFTER LOVERING (1934)

NOT TO SCALE

FIGURE 1-3

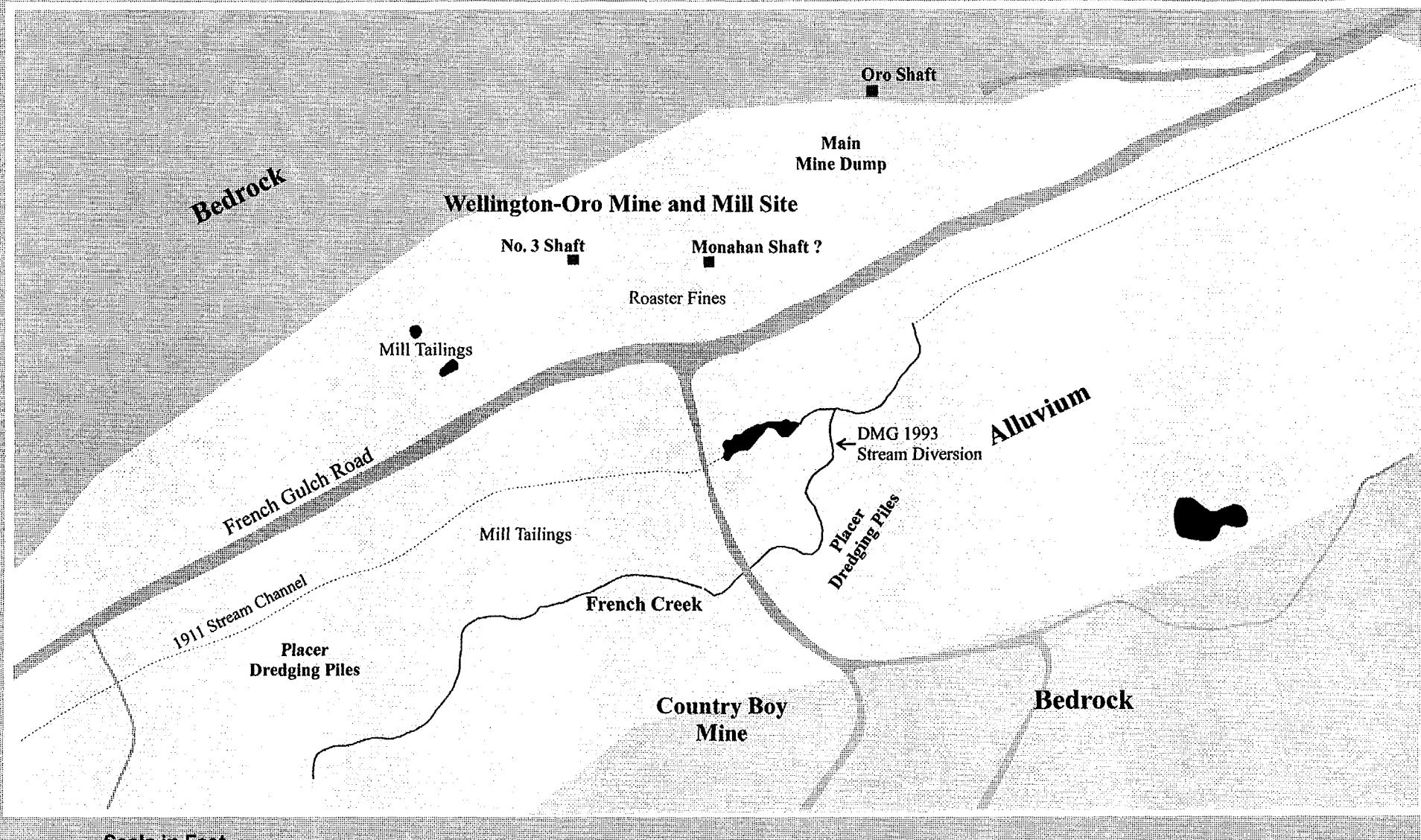


Location Map

0 Kilometers 8

0 Miles 5

Figure 2-1



French Gulch

Base Map Study Area

Figure 2-2

Prospect Hill

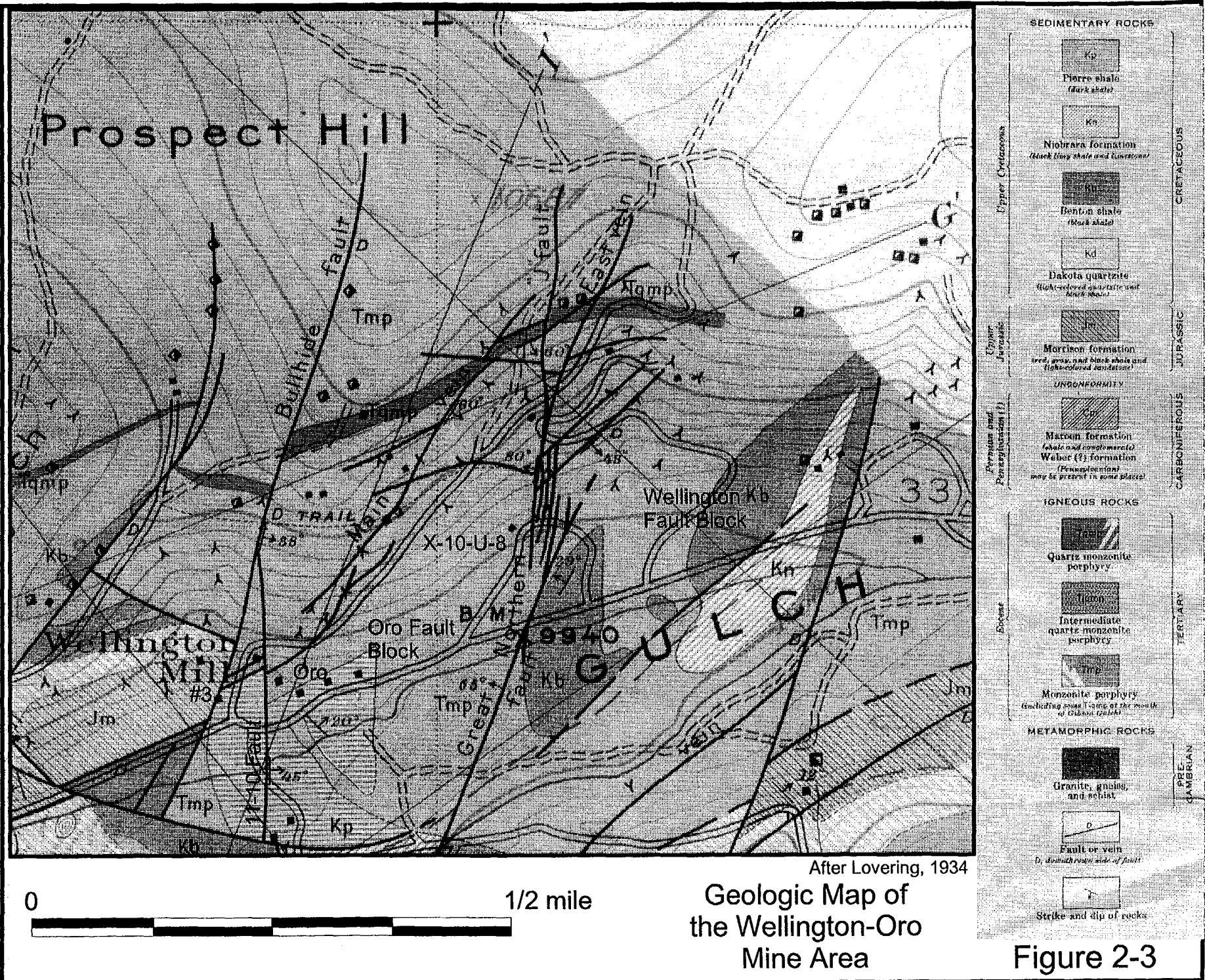
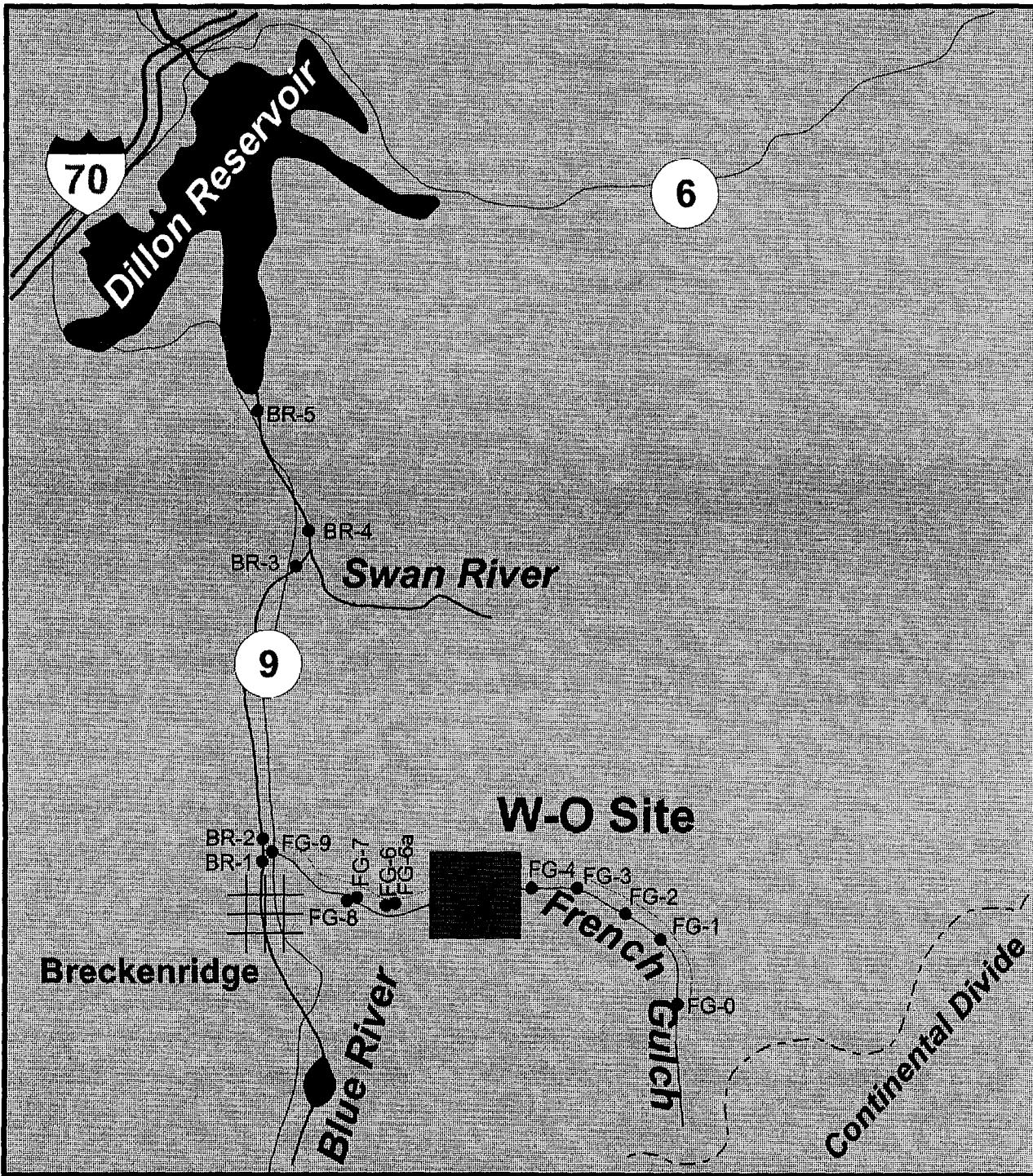


Figure 2-3



Surface Water Quality Sample Locations

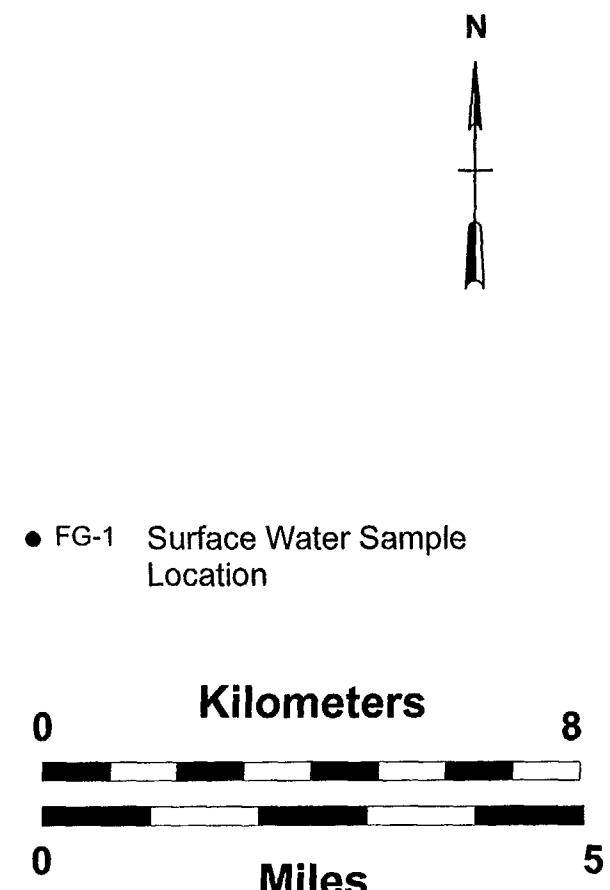


Figure 3-1

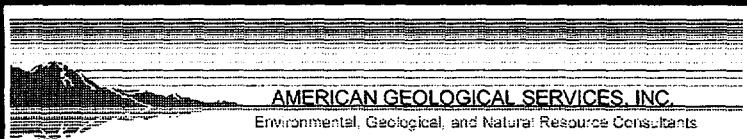
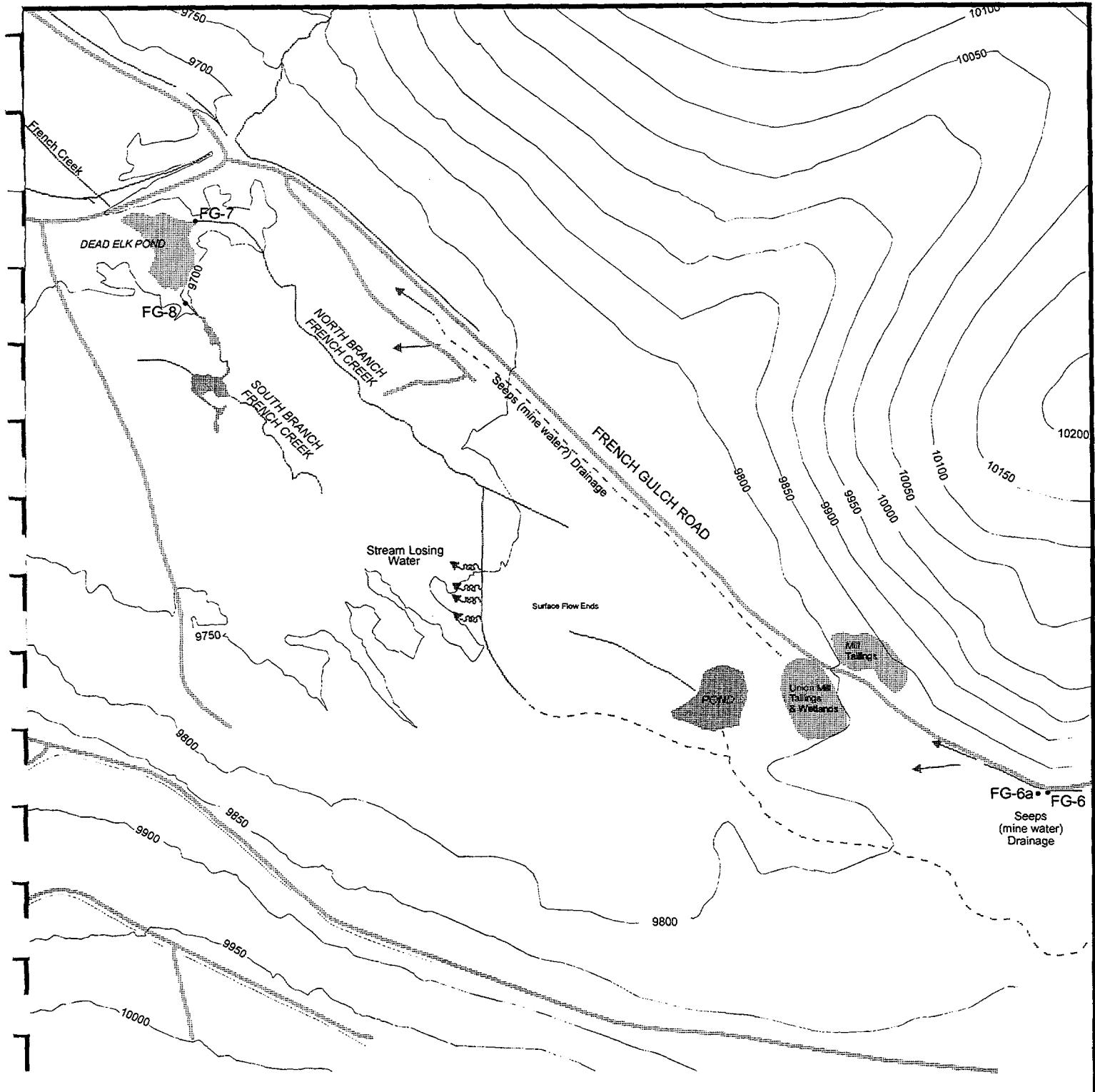


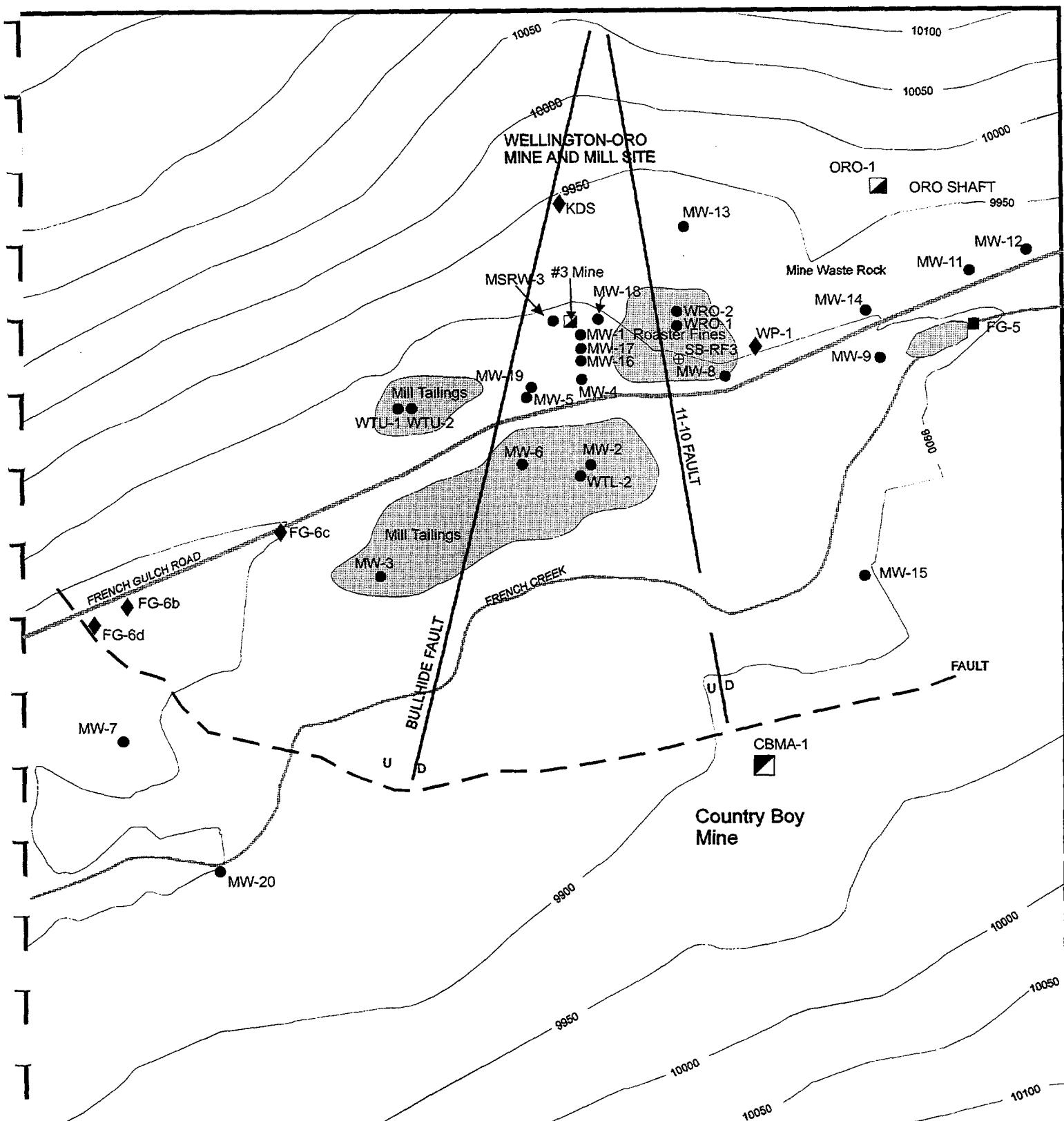
Figure 3-1a
Base Map Lower French Creek Area

Project Name: French Gulch

Project Number: CO97DE-056

Date: 12/19/97 Drawn By: MAA

Reviewed By: AM



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Environmental, Geological, and Natural Resource Consultants

Figure 3-2
Wellington-Oro Site Ground and Surface Water Sample Location Map

Project Name: French Gulch

Date: 12/19/97 Drawn By: MAA Reviewed By: AM

French Creek and Blue River Total Flow

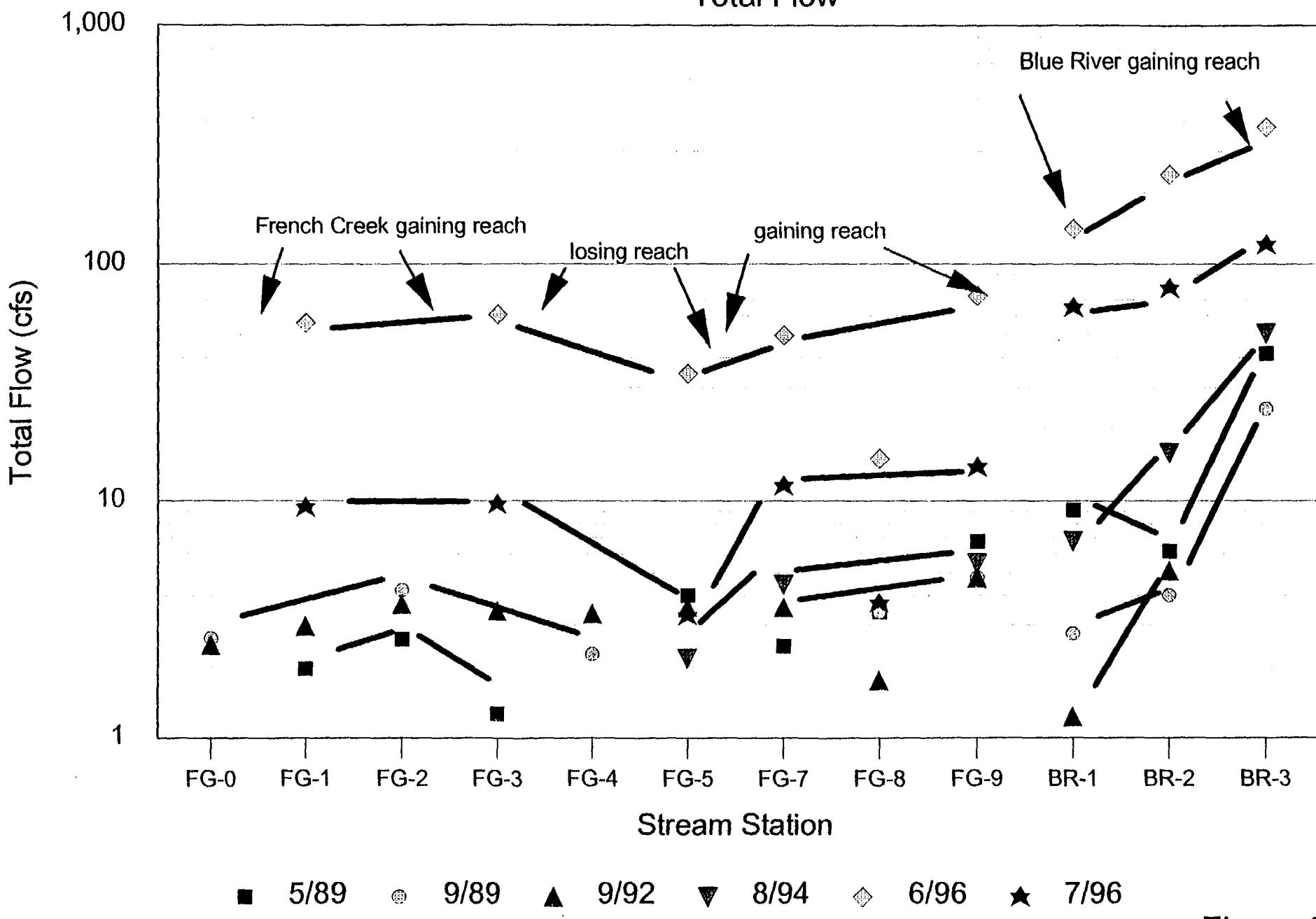


Figure 3-3

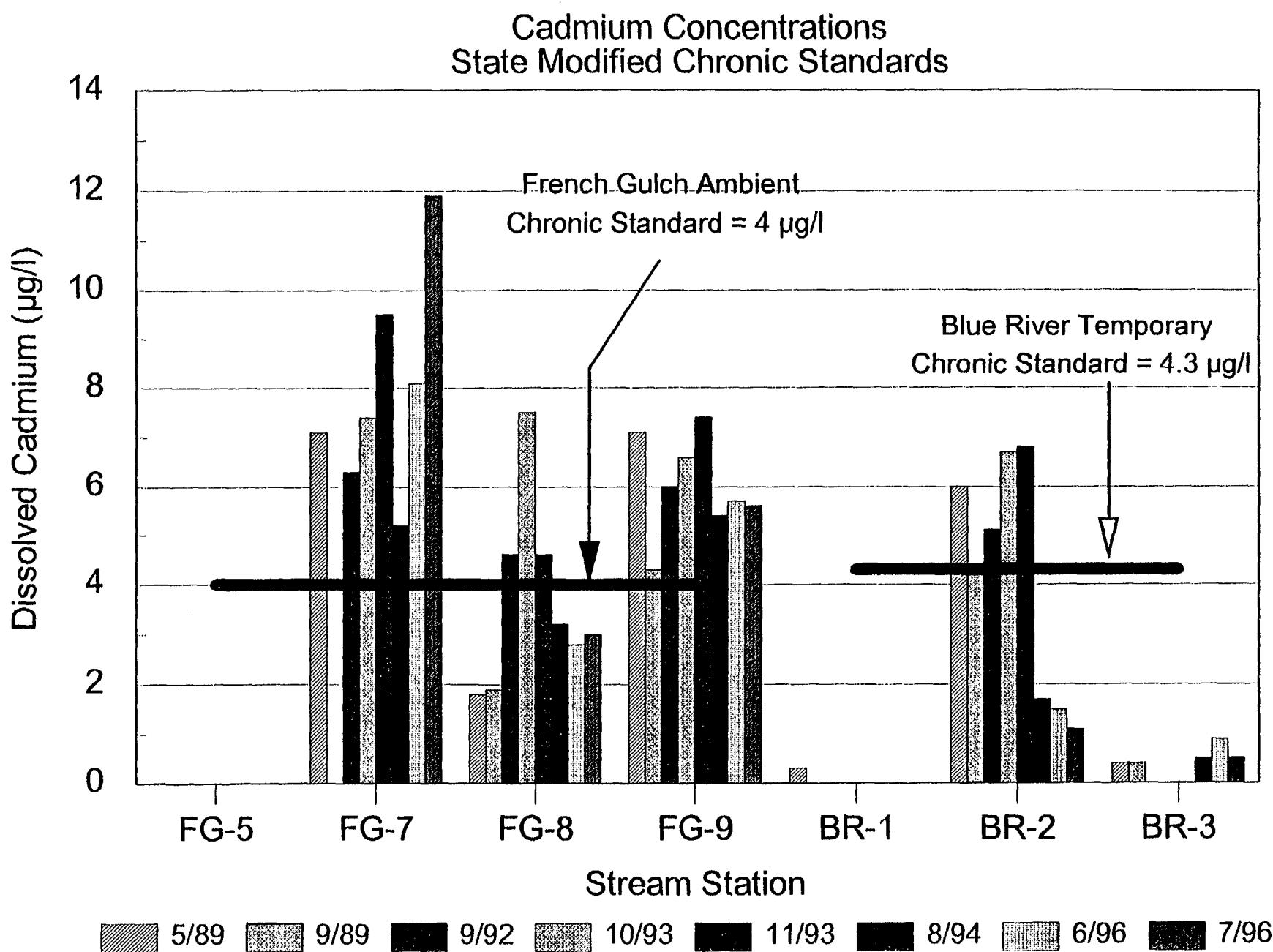


Figure 3-4

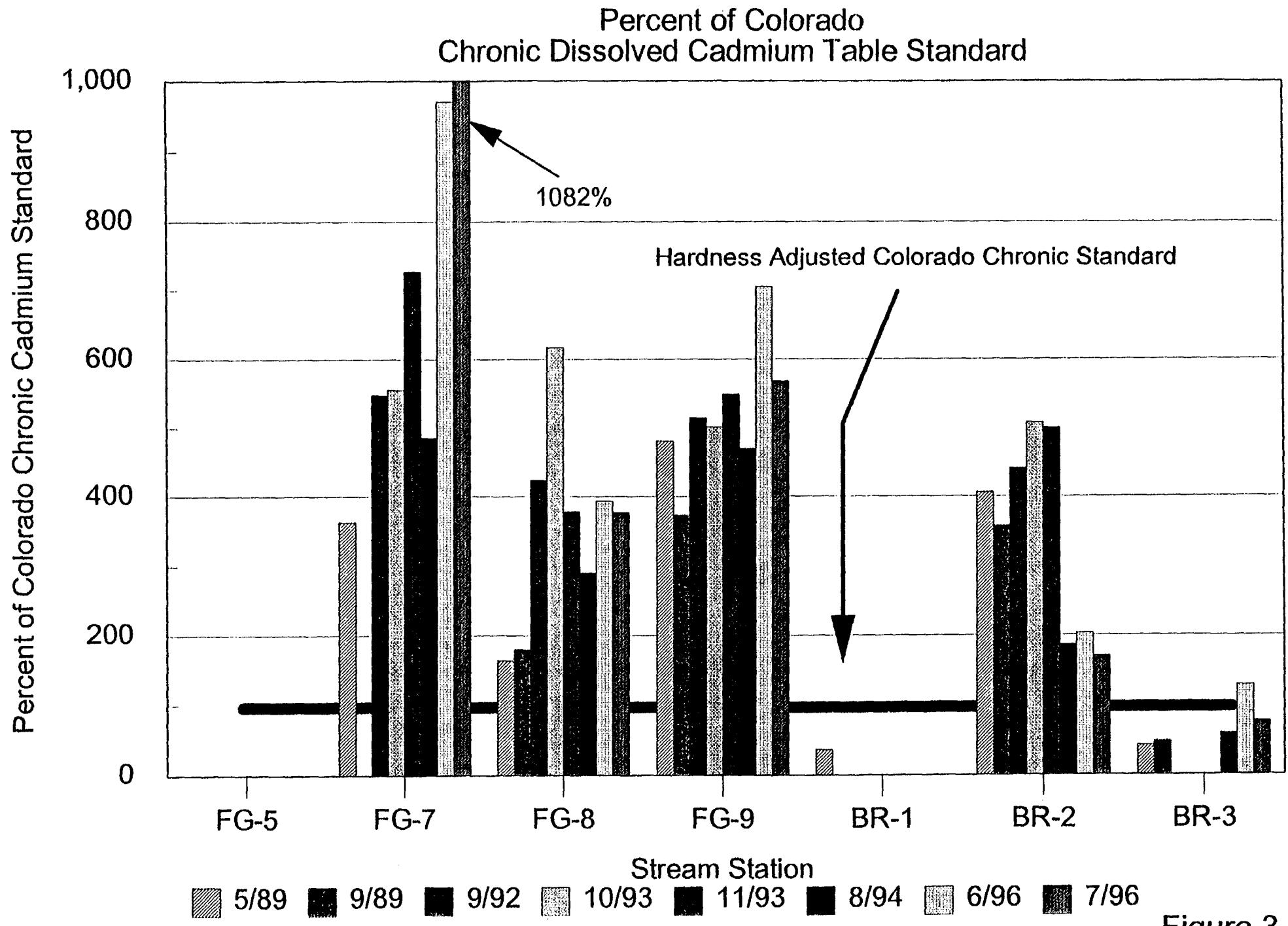


Figure 3-5

Percent of Colorado
Acute Dissolved Cadmium Table Standard

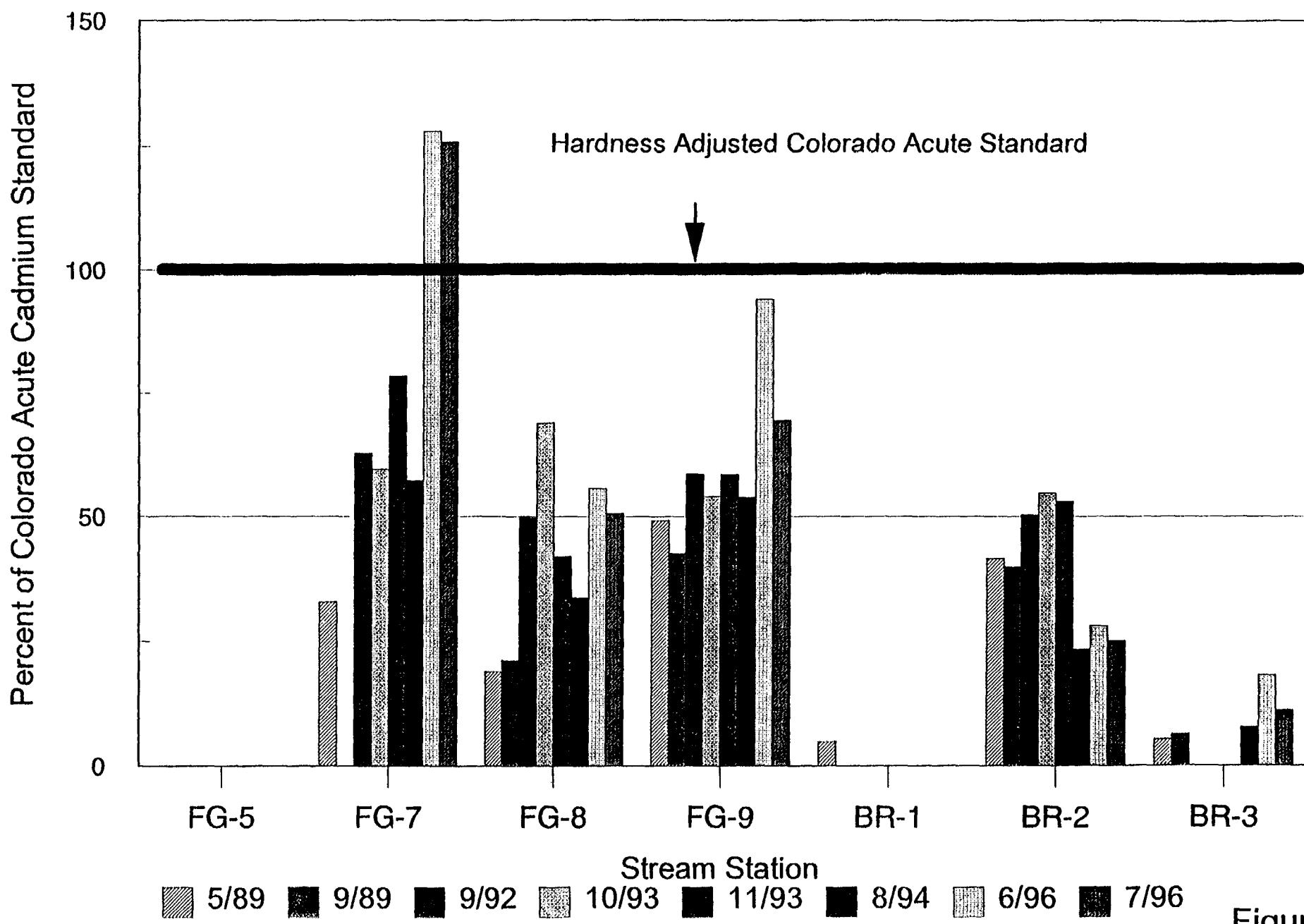


Figure 3-6

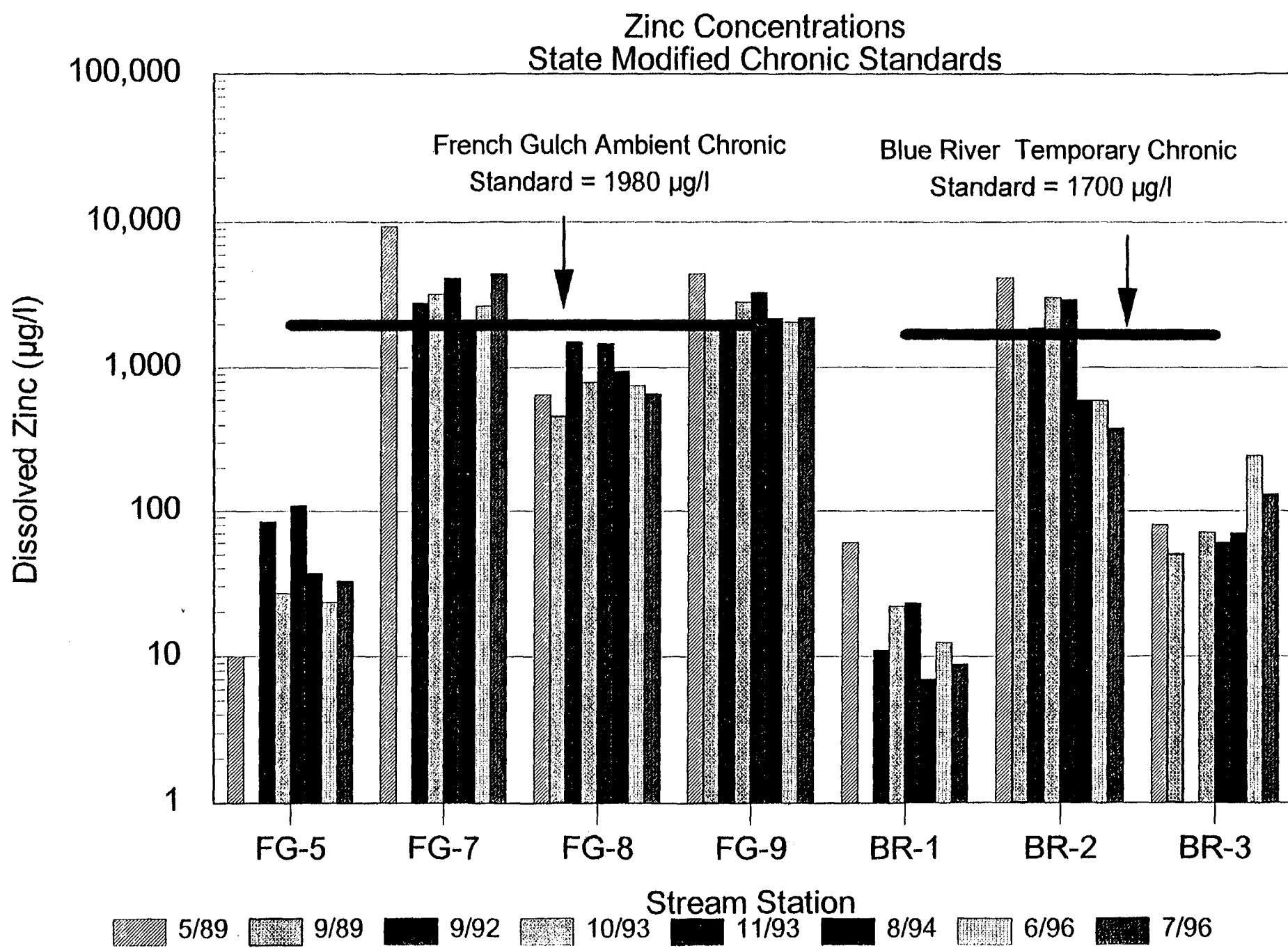


Figure 3-7

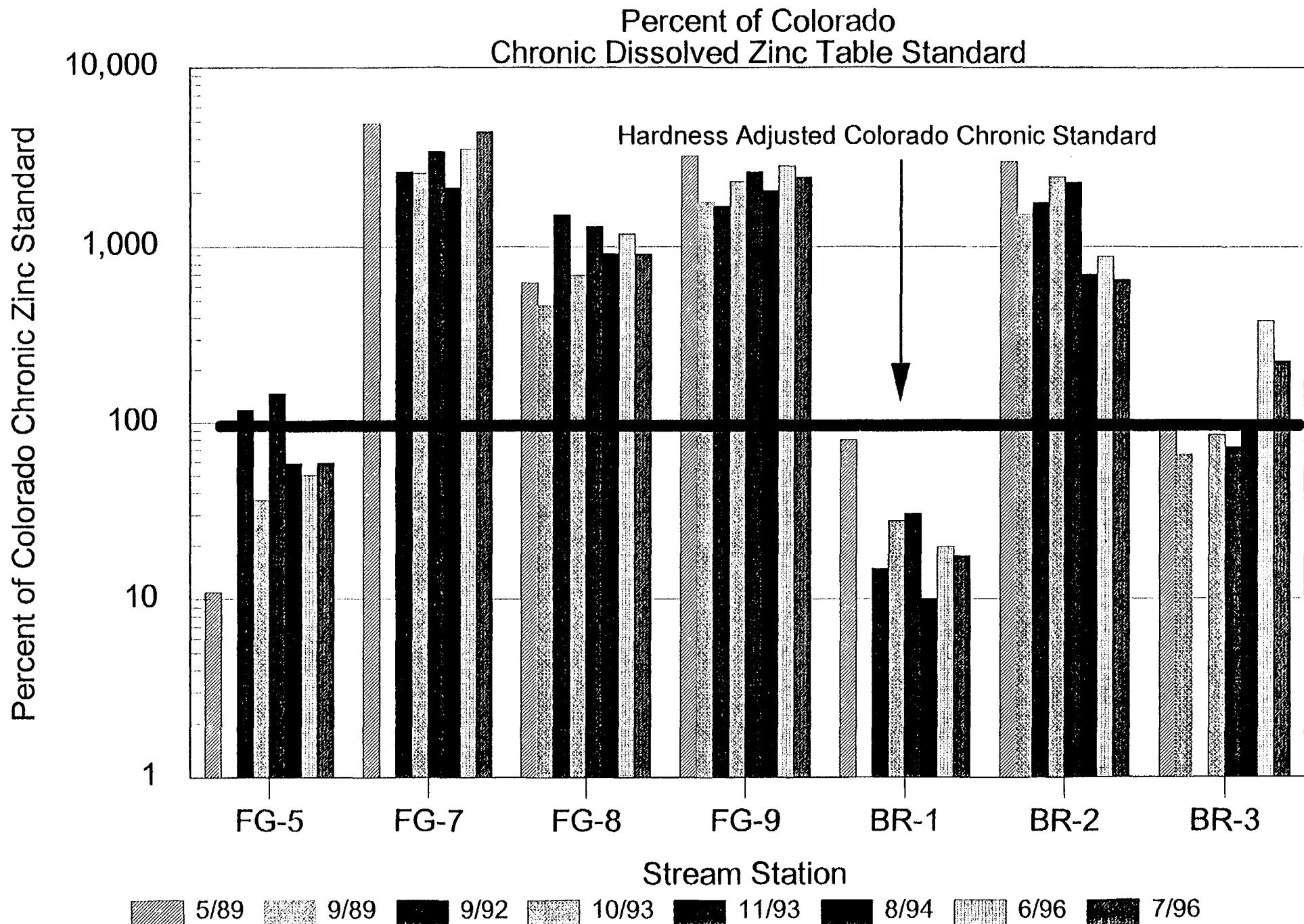


Figure 3-8

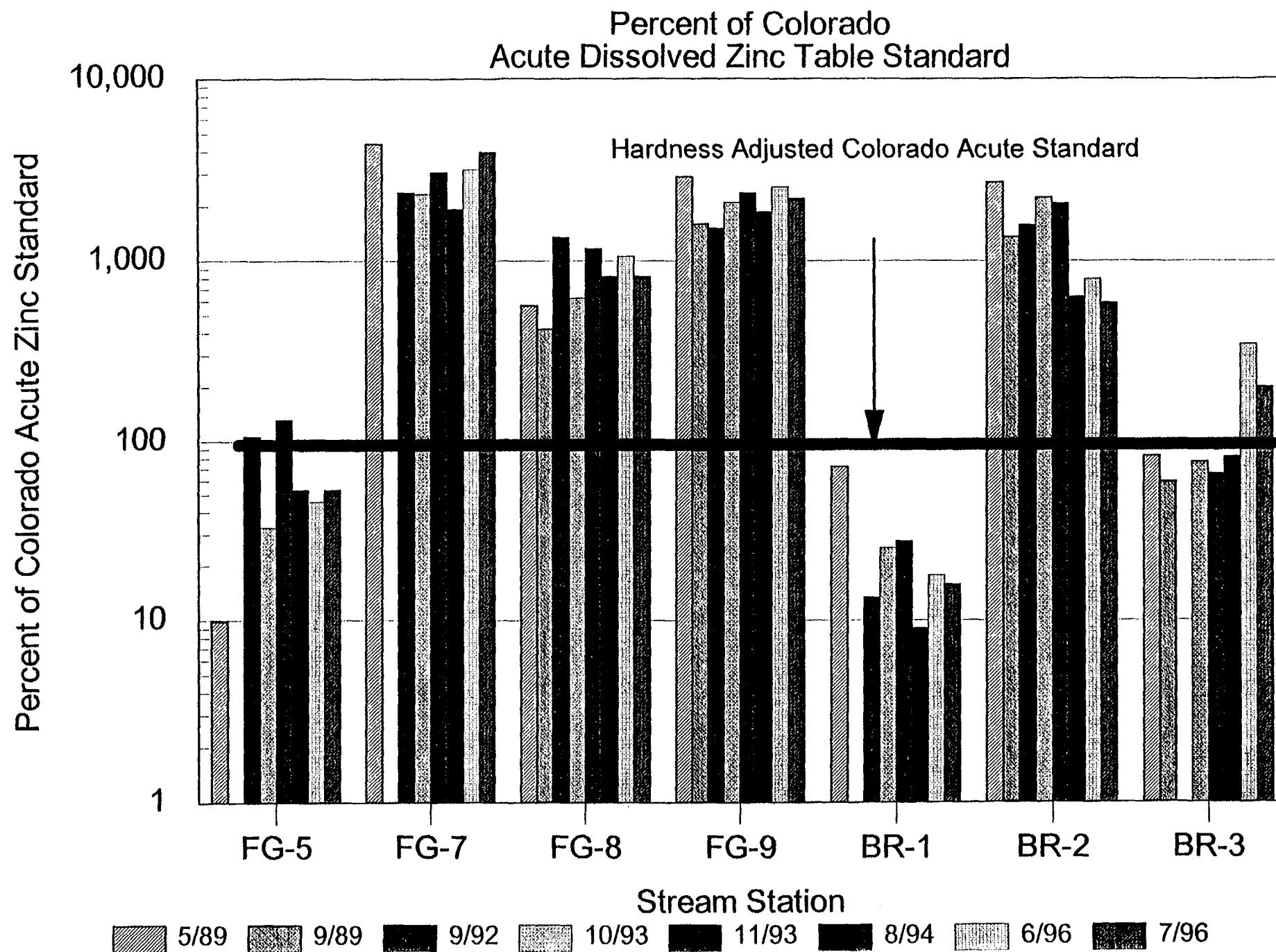


Figure 3-9

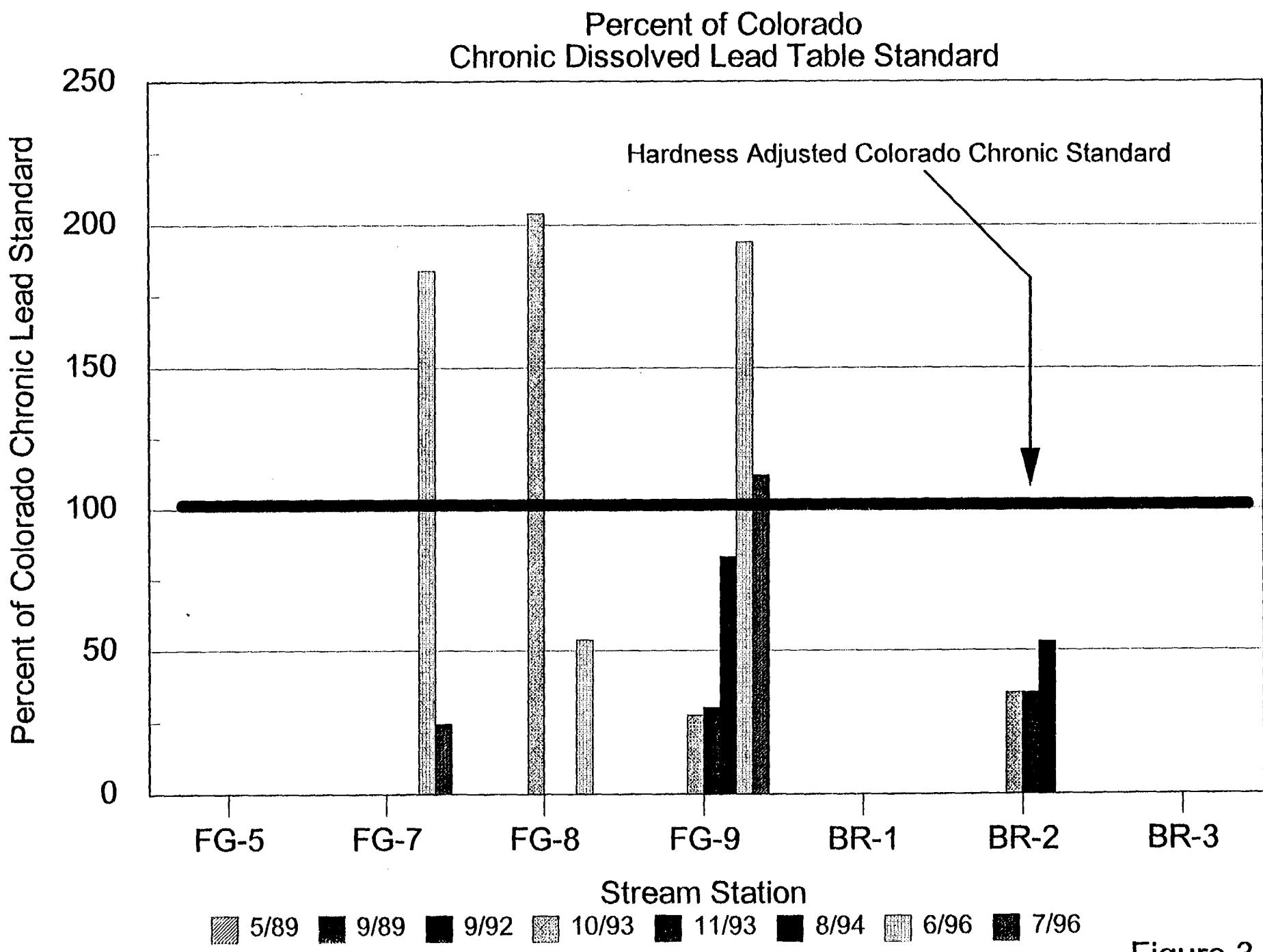
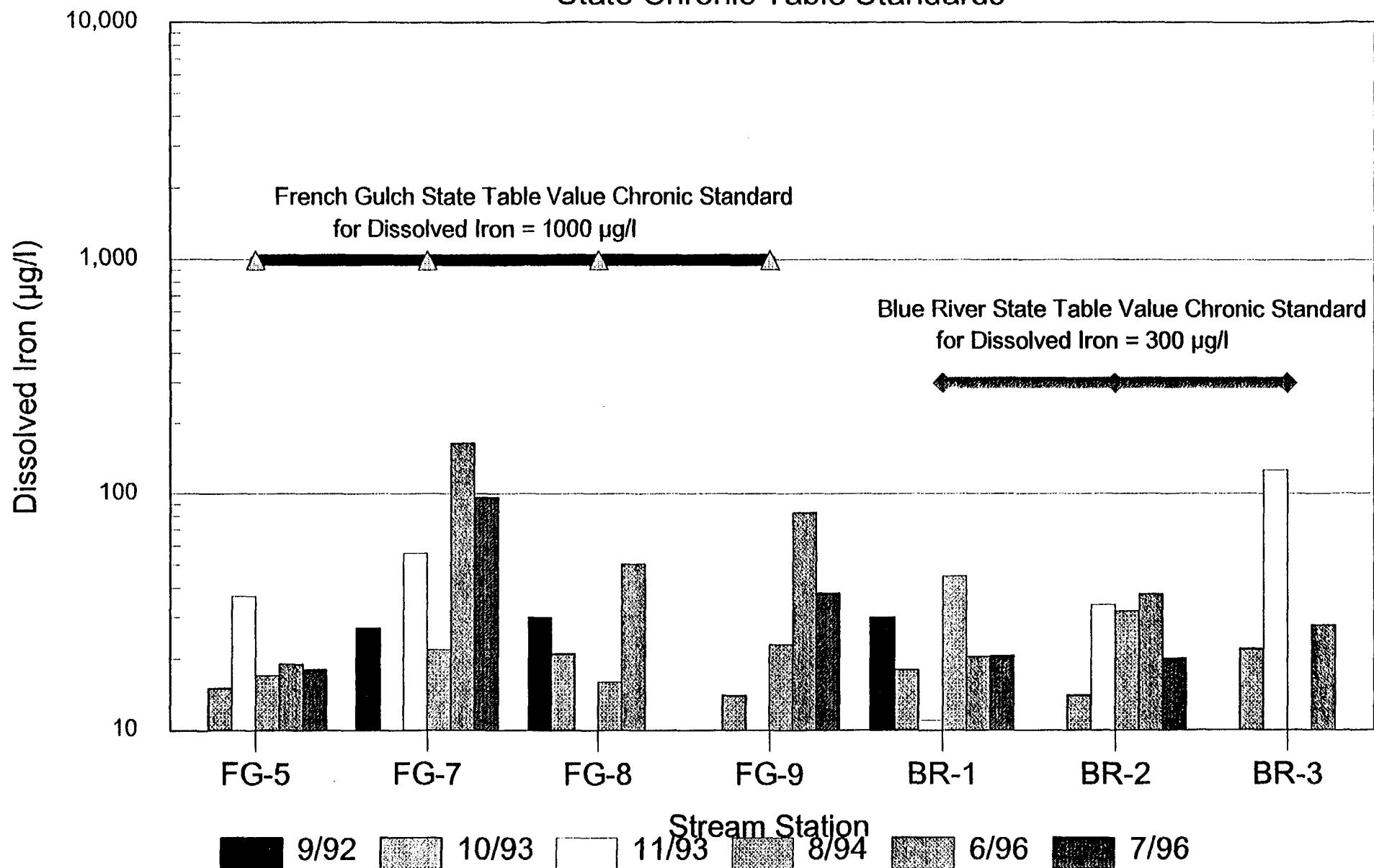


Figure 3-10

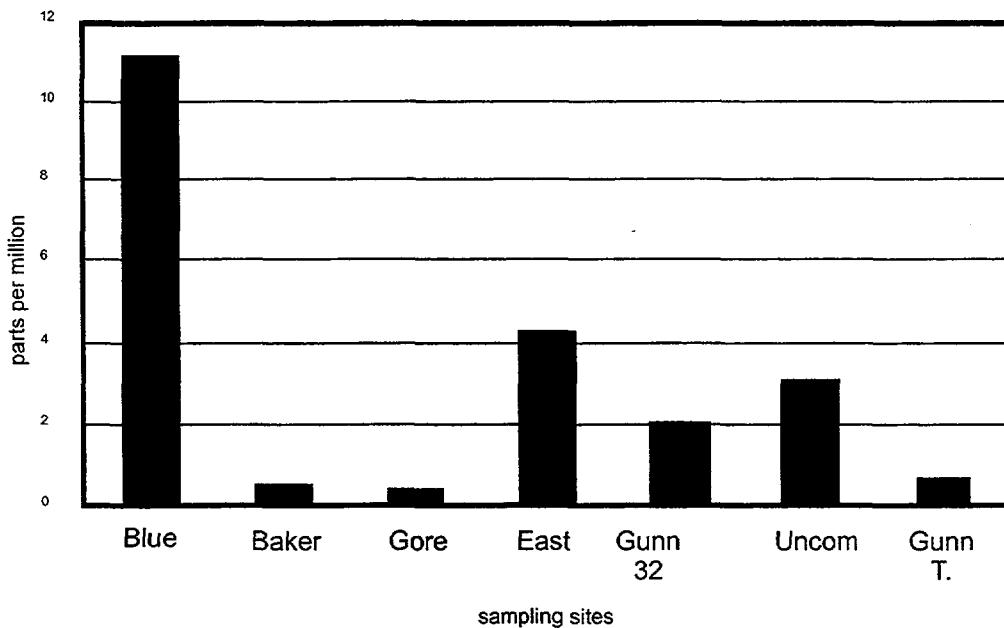
Iron Concentrations State Chronic Table Standards



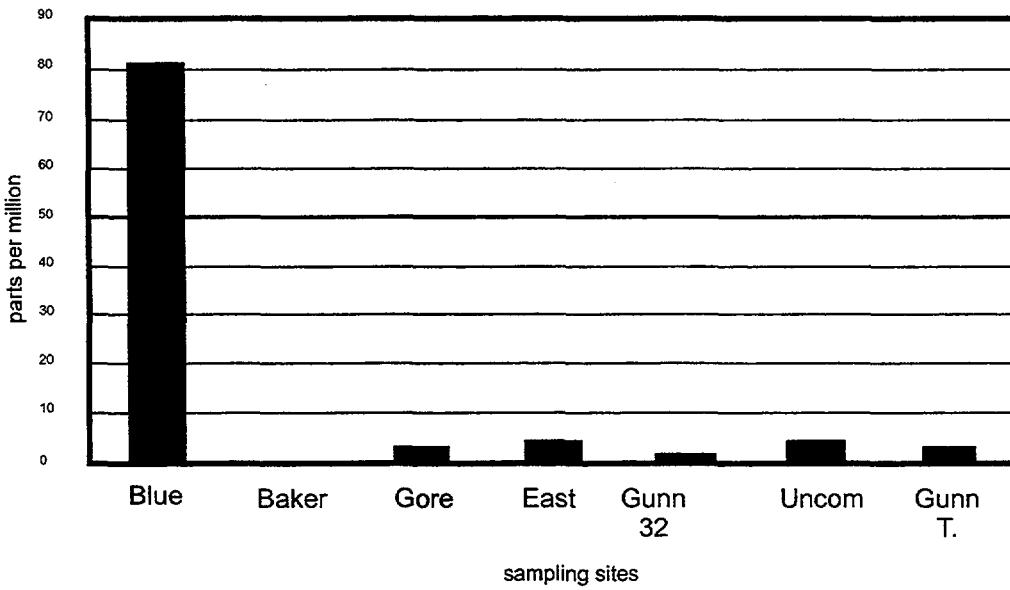
Note: There is no Colorado Acute Standard for Dissolved Iron.

Figure 3-11

Cd in bed sediment



Cd in fish livers



From NAWQA, 1997b

Figure 3-12

French Creek (FG-9)
Bed Sediment

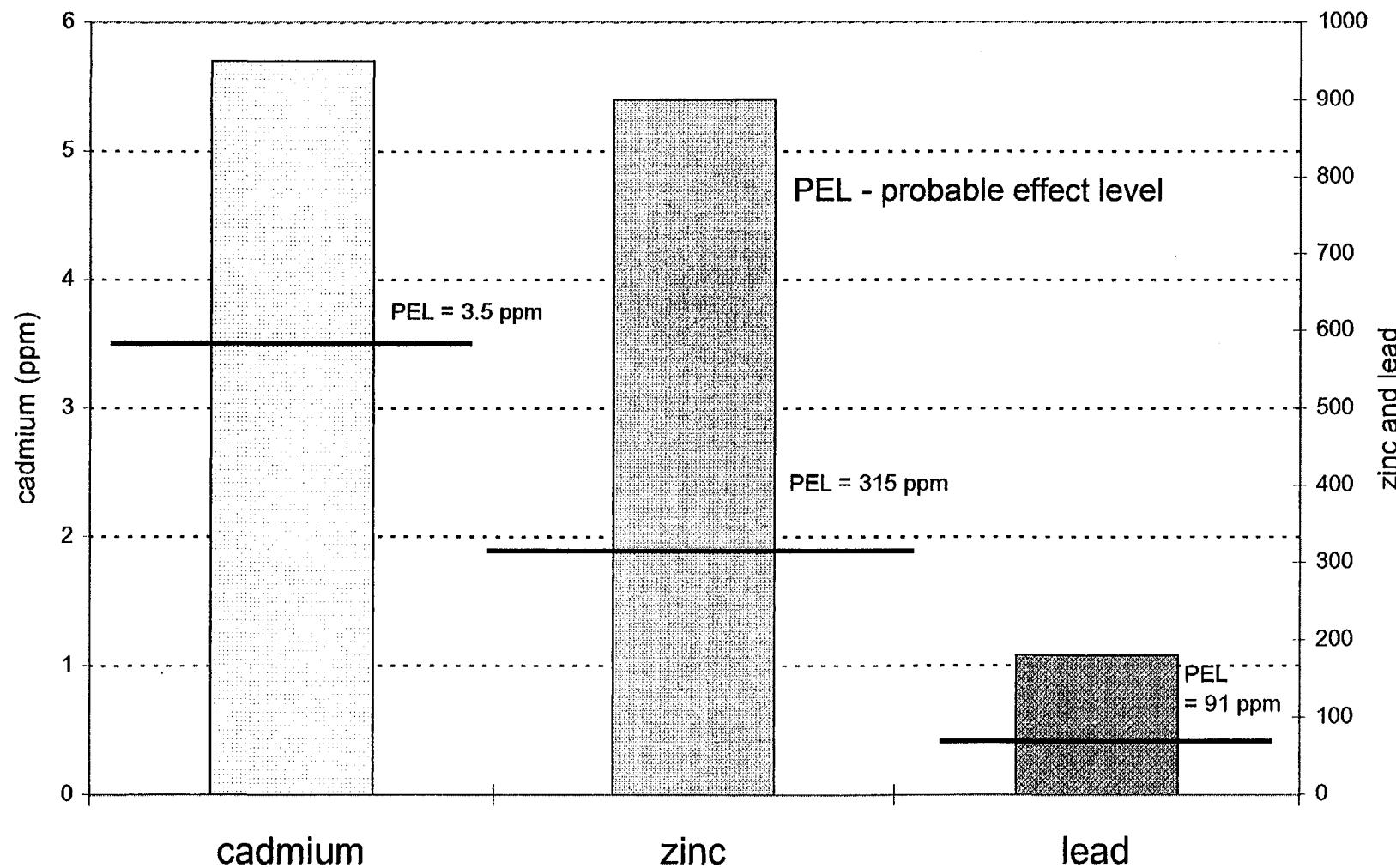
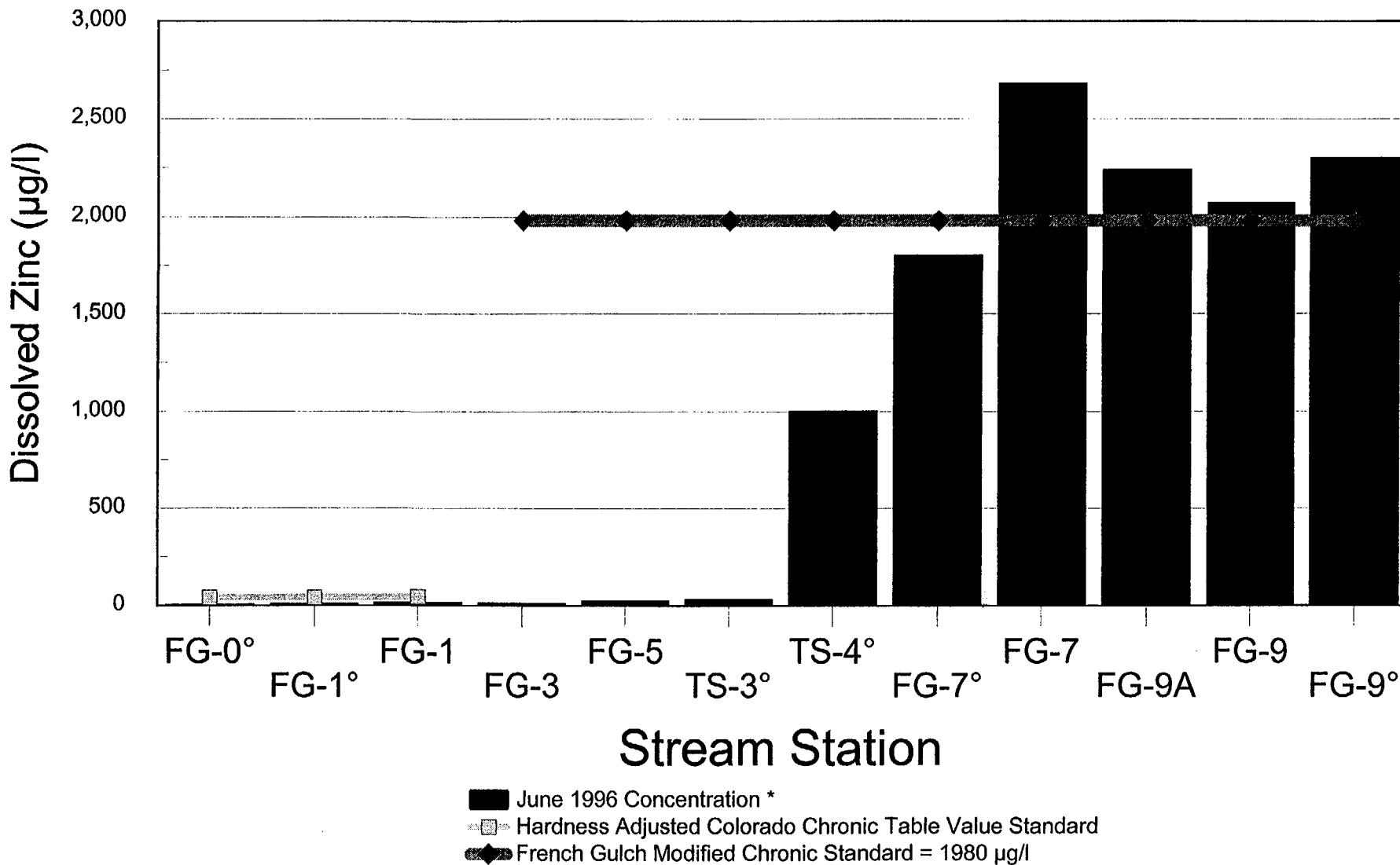


Figure 3-13

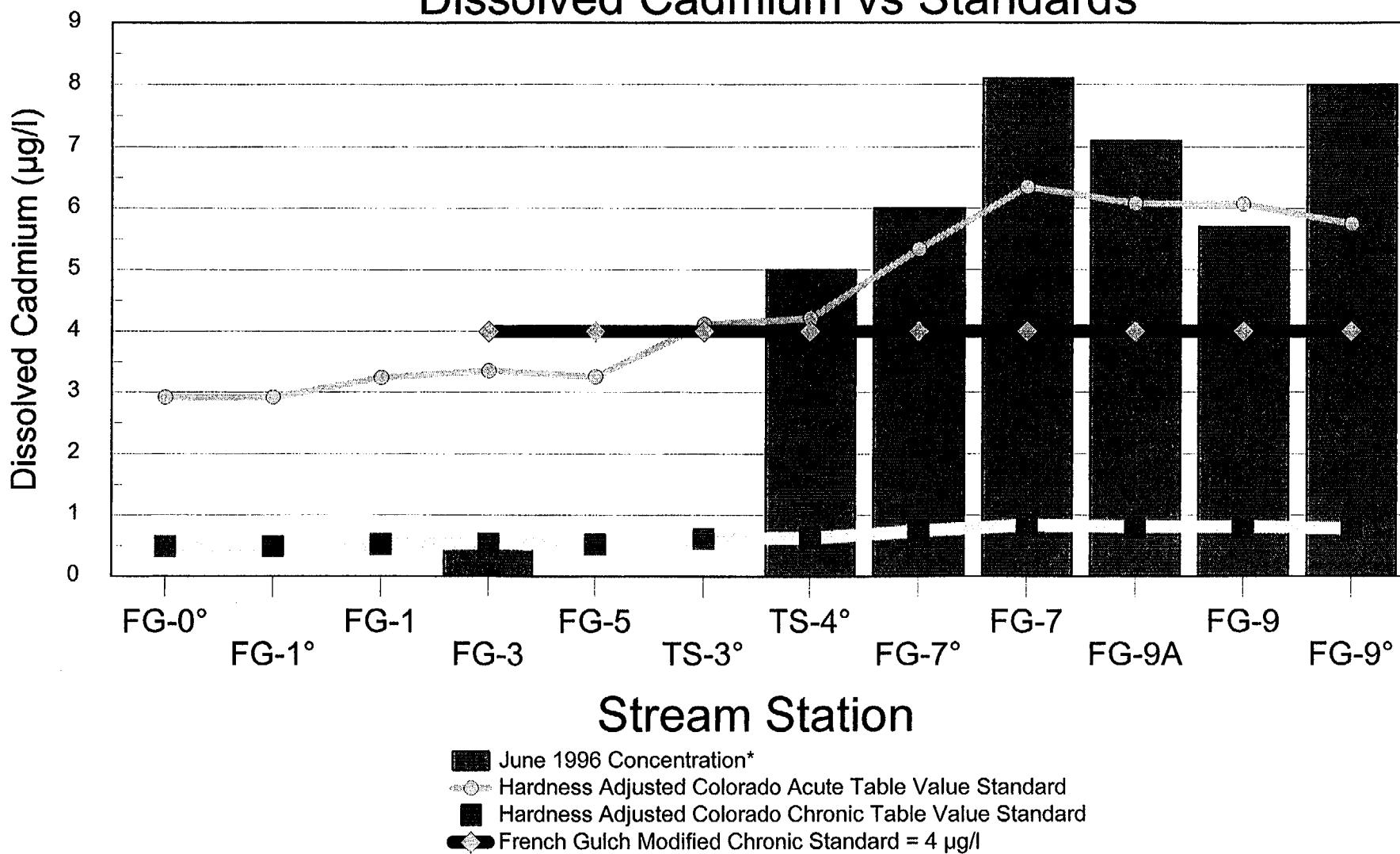
French Gulch Water Quality Data Dissolved Zinc vs Chronic Standards



* Data for USGS Sites (°) Was Collected May 23-27, 1996 Note: Chronic Standards Are Based On A 30-Day Average

Figure 3-14

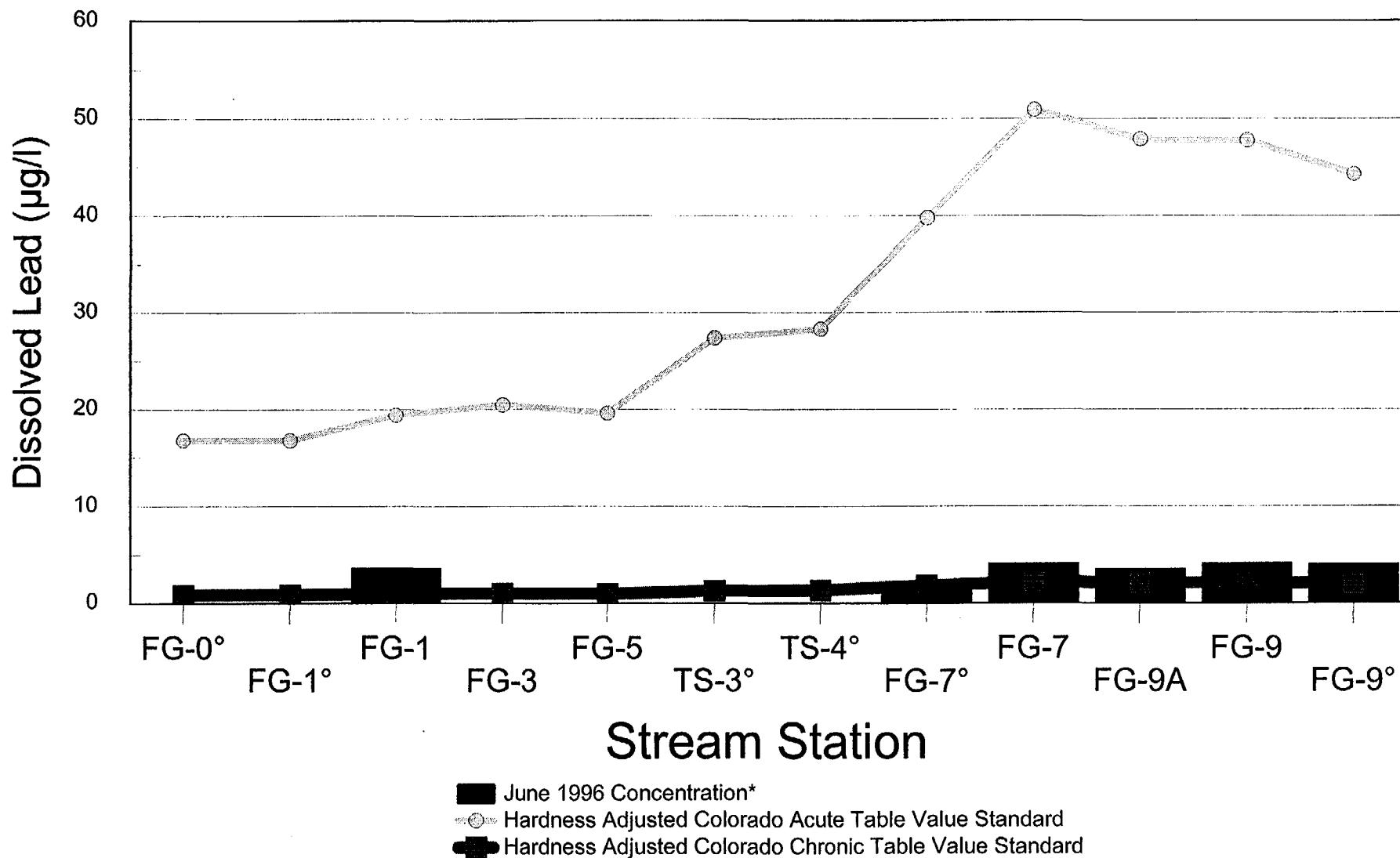
French Gulch Water Quality Data Dissolved Cadmium vs Standards



* Data for USGS Sites (°) Was Collected May 23-27, 1996 Note: Chronic Standards Are Based On A 30-Day Average

Figure 3-15

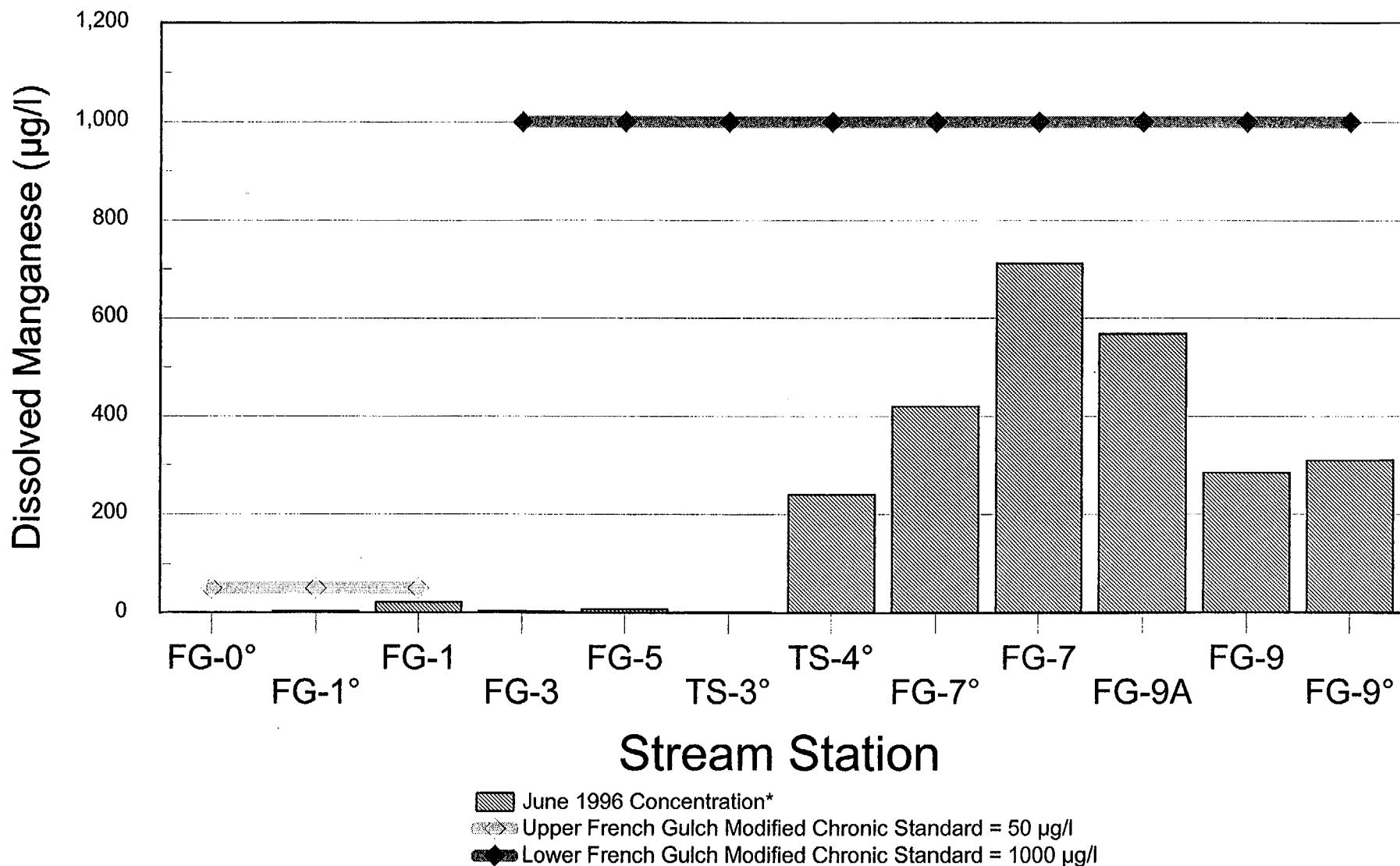
French Gulch Water Quality Data Dissolved Lead vs Acute and Chronic Standards



* Data for USGS Sites (°) Was Collected May 23-27, 1996 Note: Chronic Standards Are Based On A 30-Day Average

Figure 3-16

French Gulch Water Quality Data Dissolved Manganese vs Chronic Standards



* Data for USGS Sites (°) Was Collected May 23-27, 1996 Note: Chronic Standards Are Based On A 30-Day Average

Figure 3-17

Blue River Water Quality Data Dissolved Zinc vs Standards

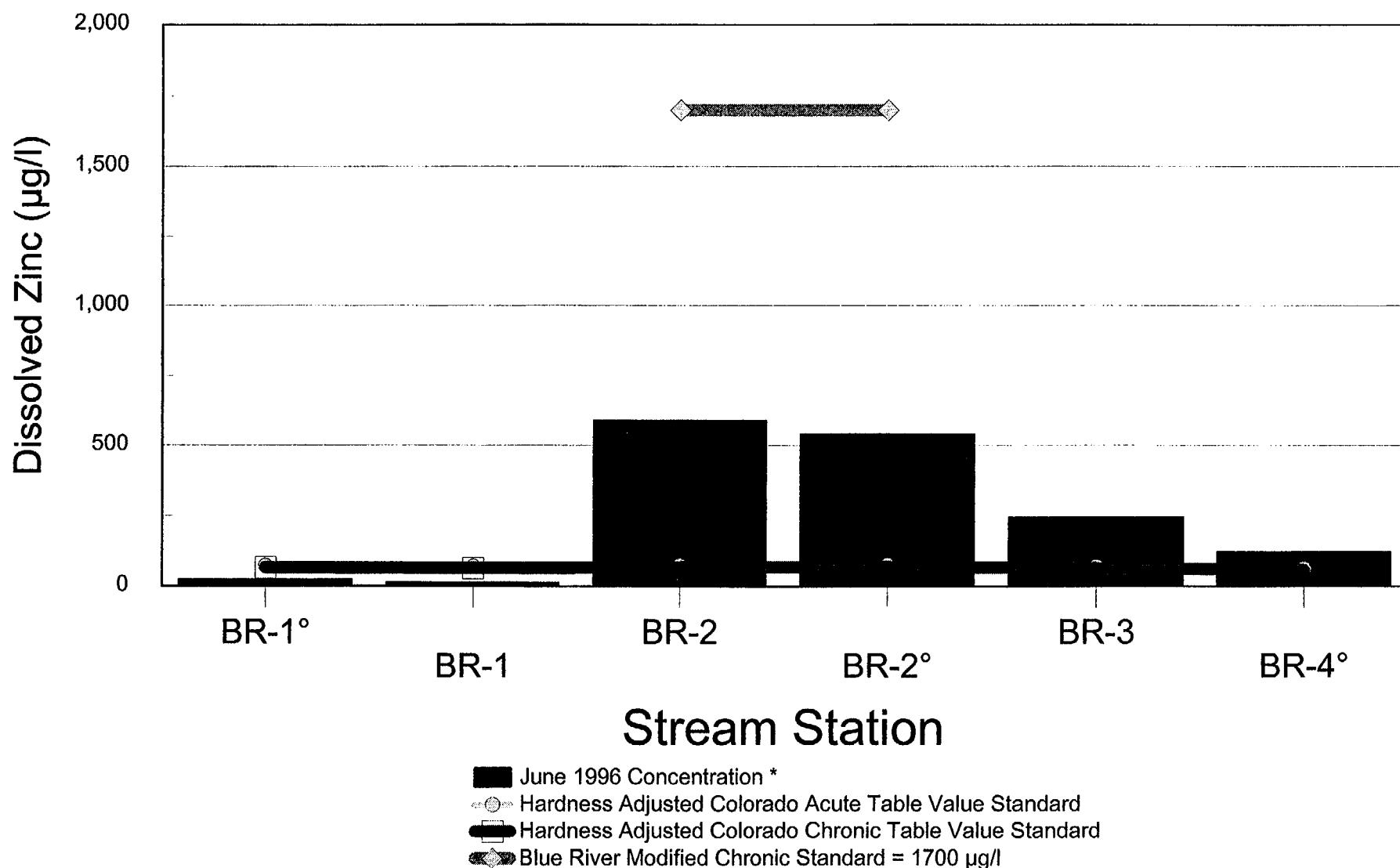


Figure 3-18

Blue River Water Quality Data

Dissolved Cadmium vs Standards

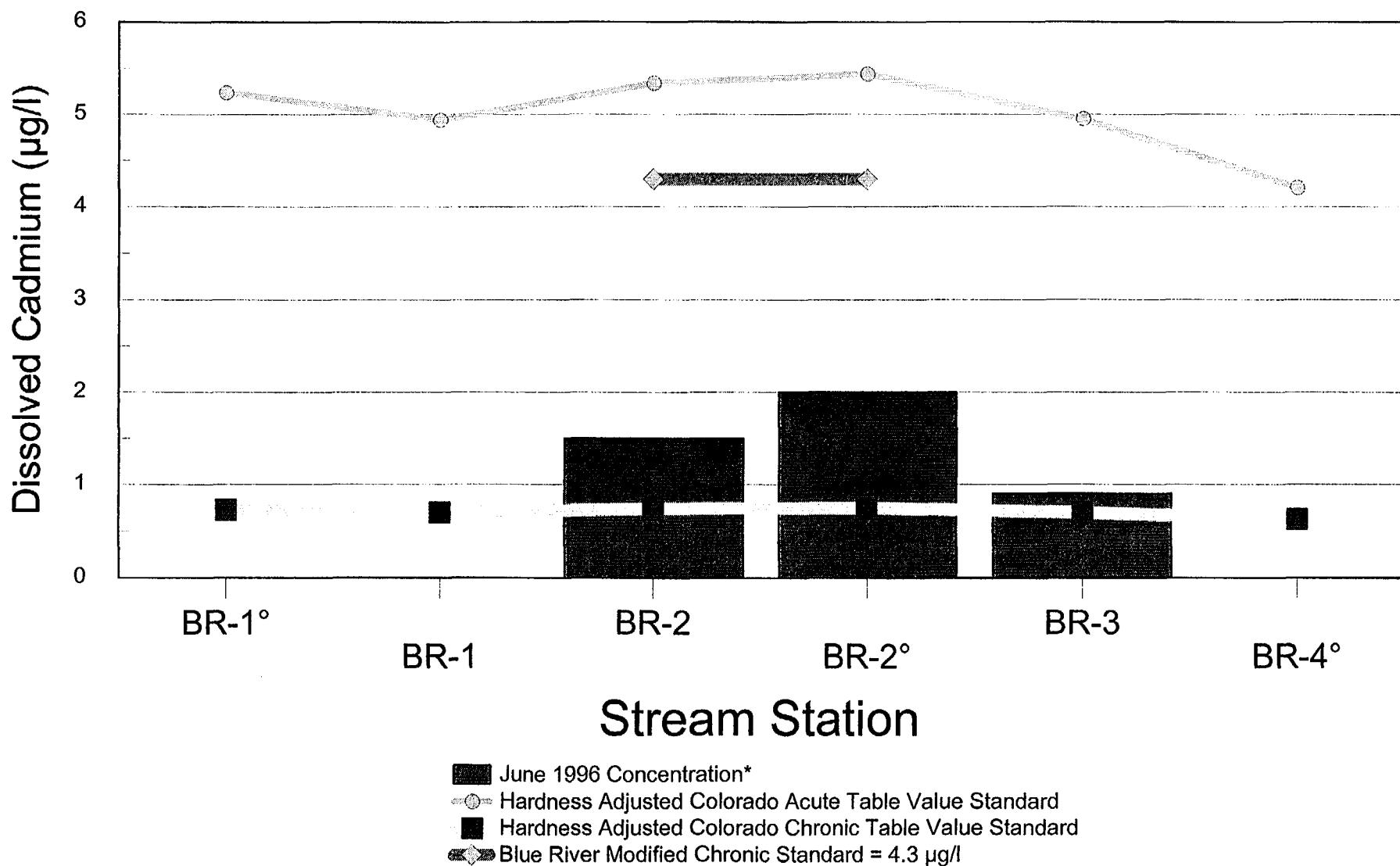
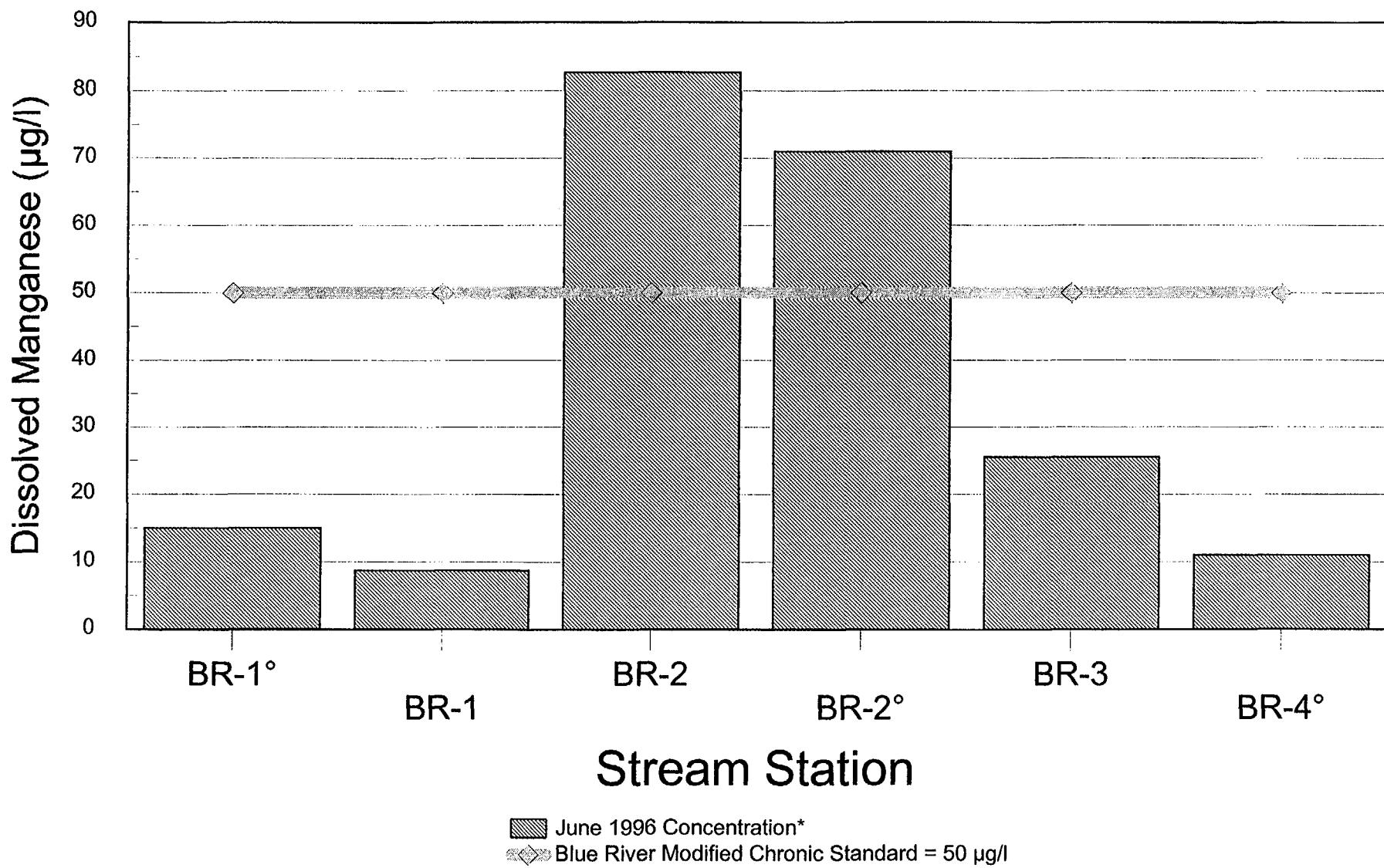


Figure 3-19

Blue River Water Quality Data

Dissolved Manganese vs Chronic Standards



* Data for USGS Sites (°) Was Collected May 21-24, 1996 Note: Chronic Standards Are Based On A 30-Day Average

Figure 3-20

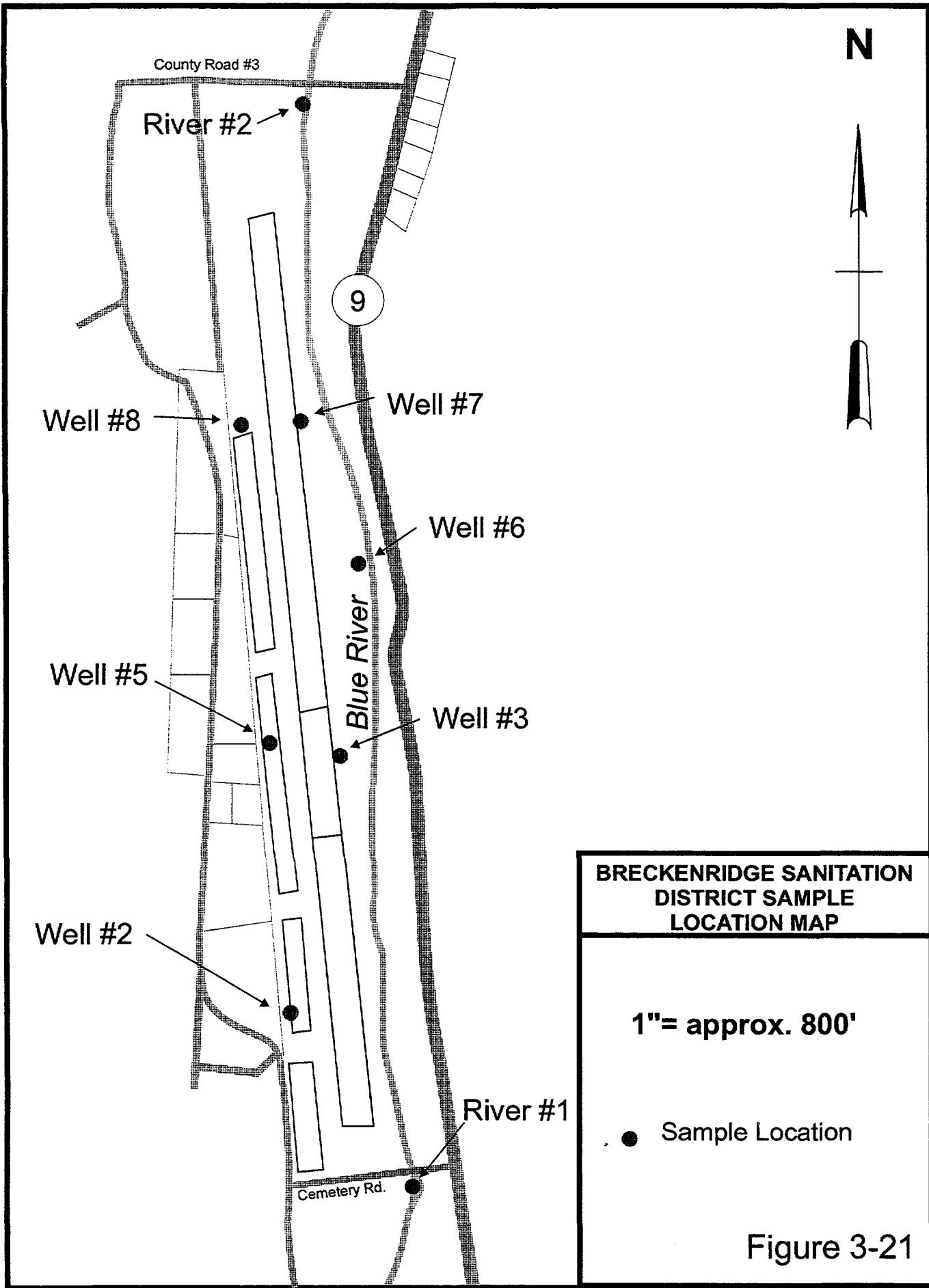


Figure 3-21

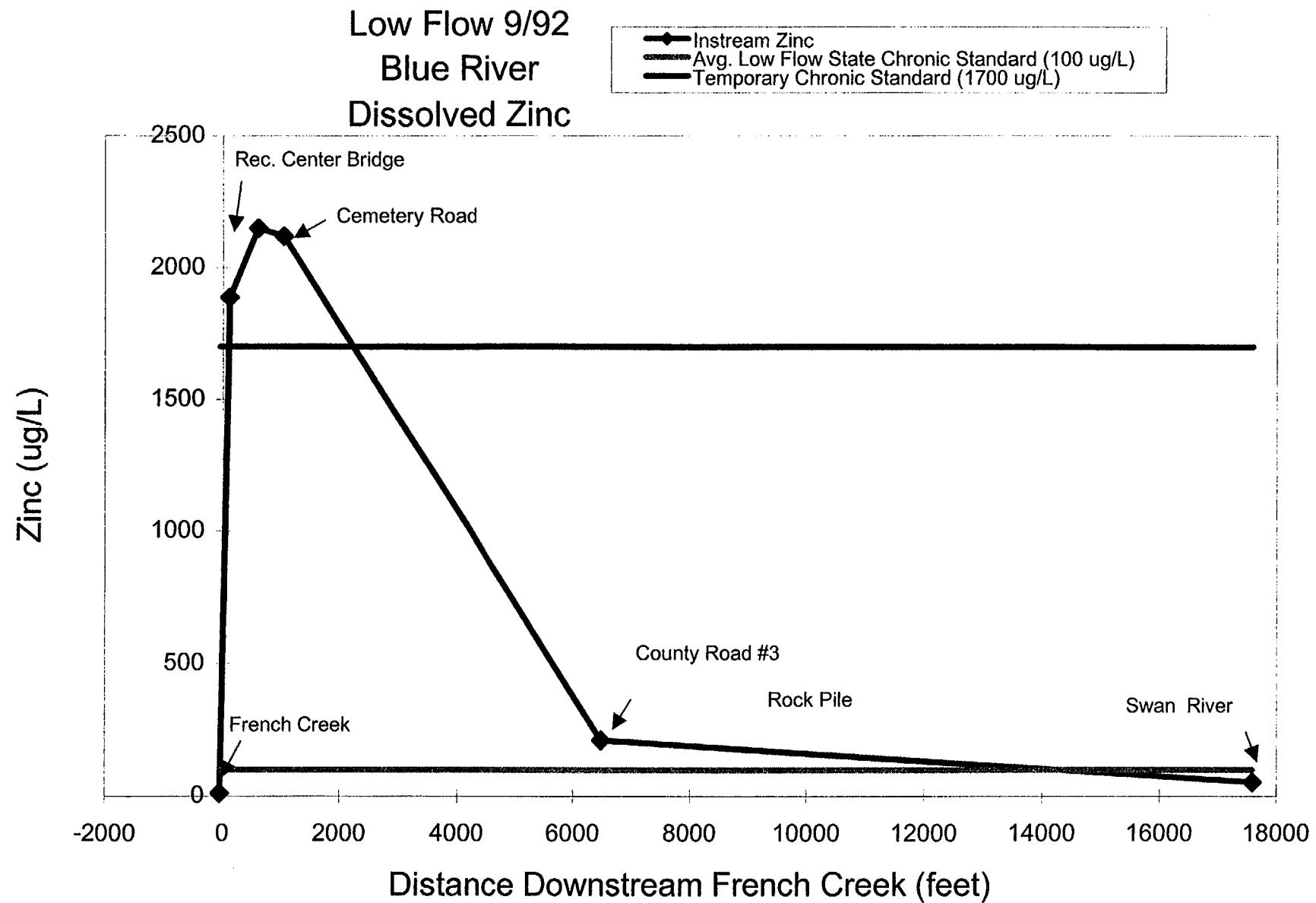


Figure 3-22

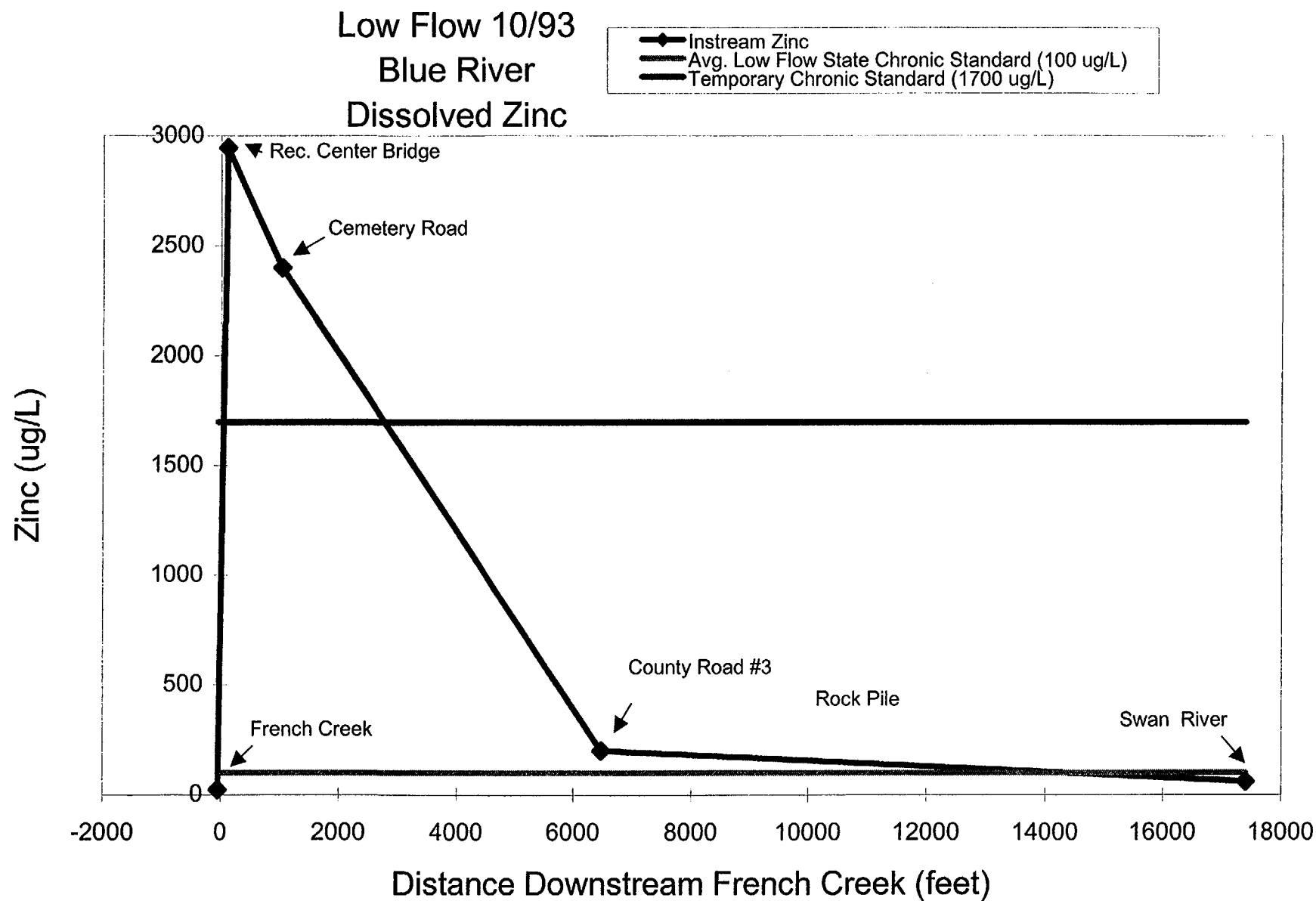


Figure 3-23

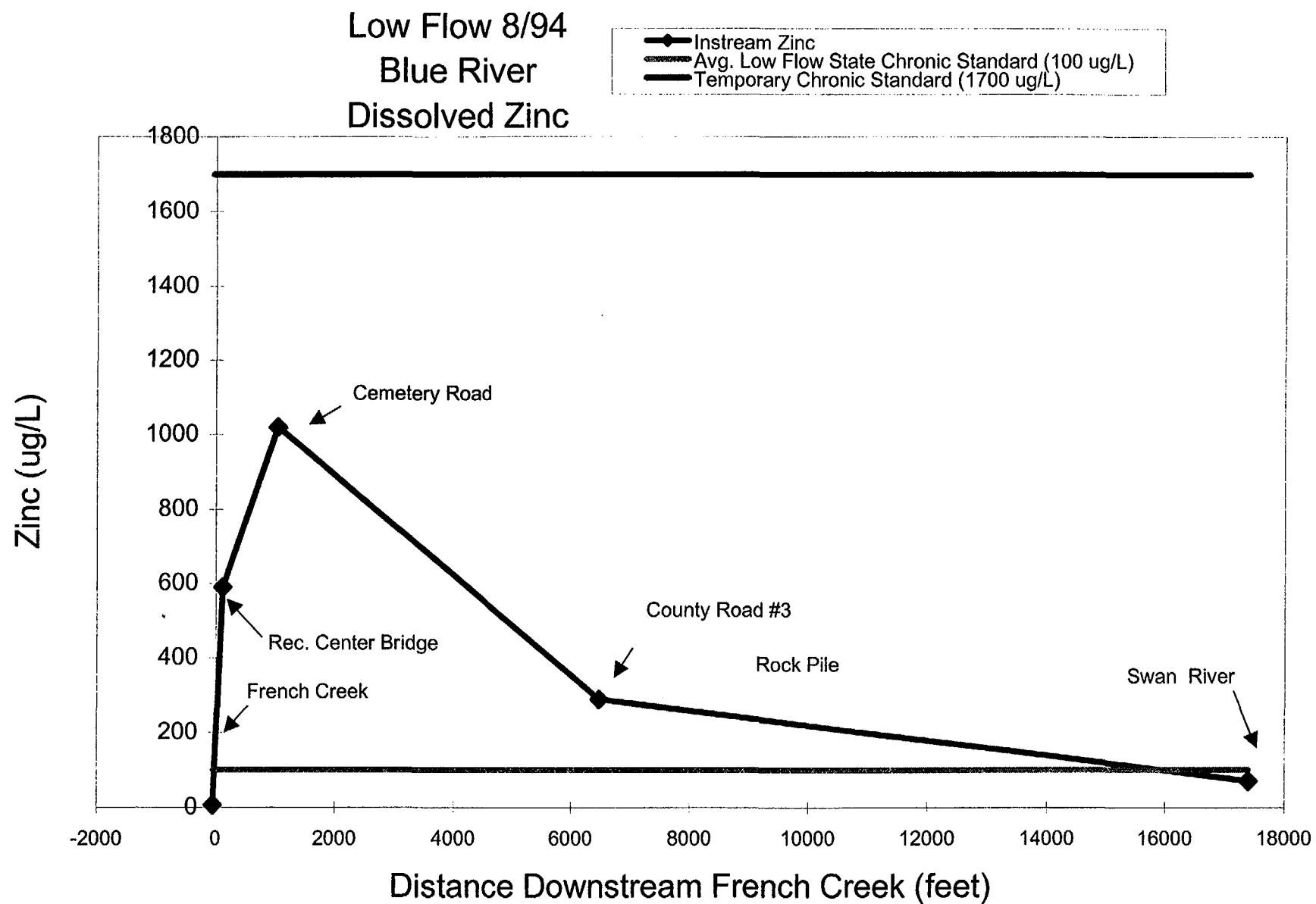


Figure 3-24

French Creek and Blue River Total Flow

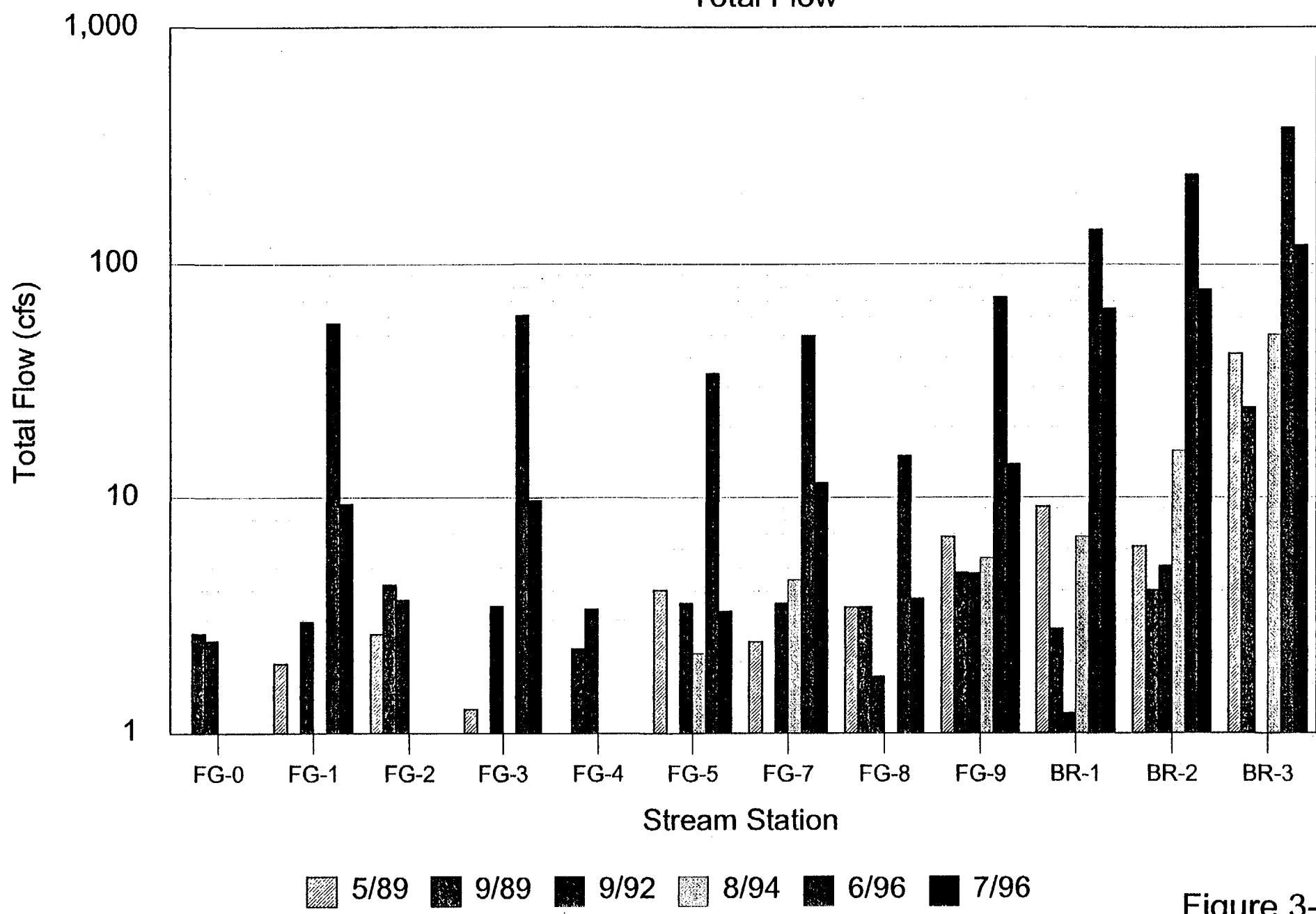


Figure 3-25

French Creek and Blue River Total Zinc Loading

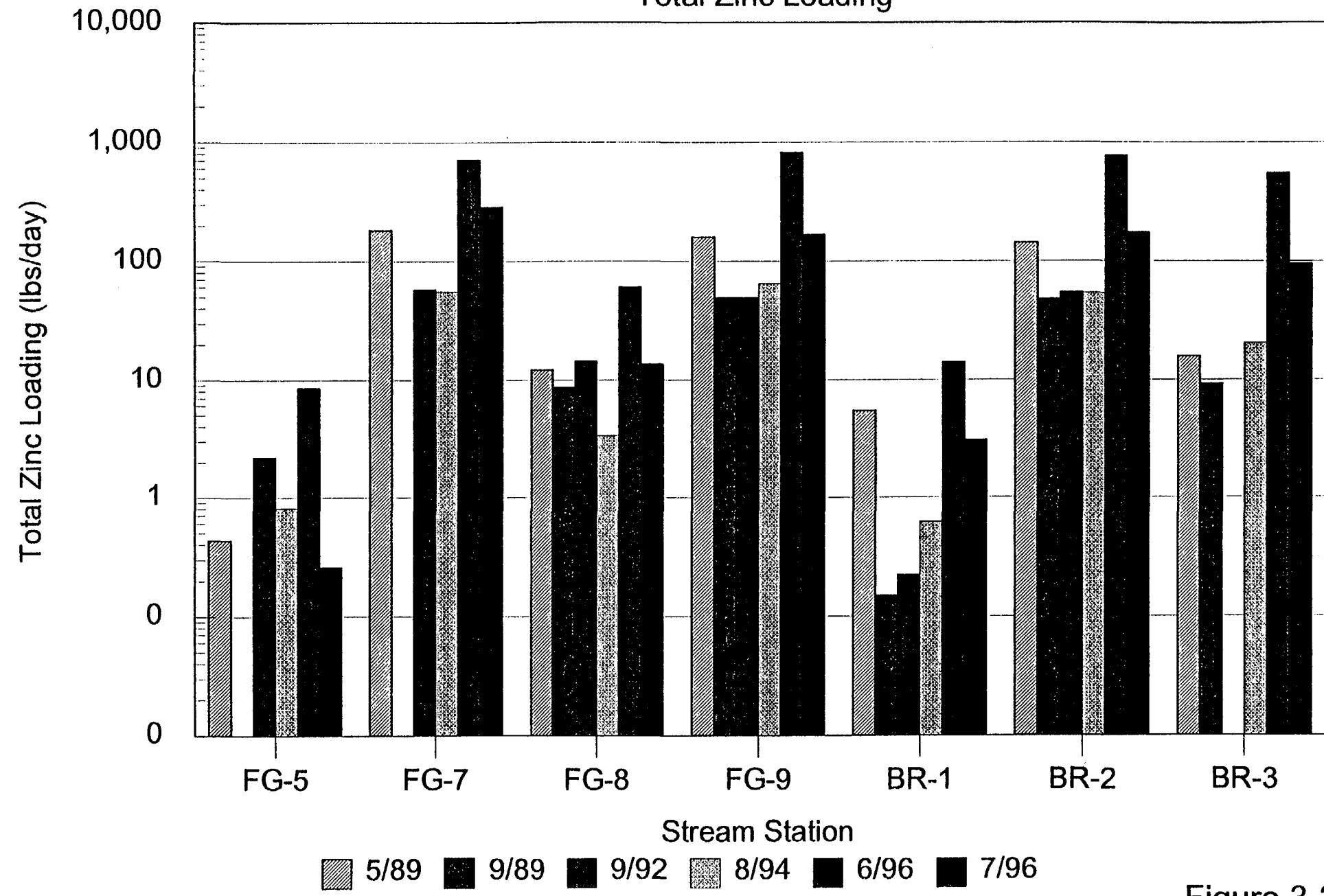


Figure 3-26

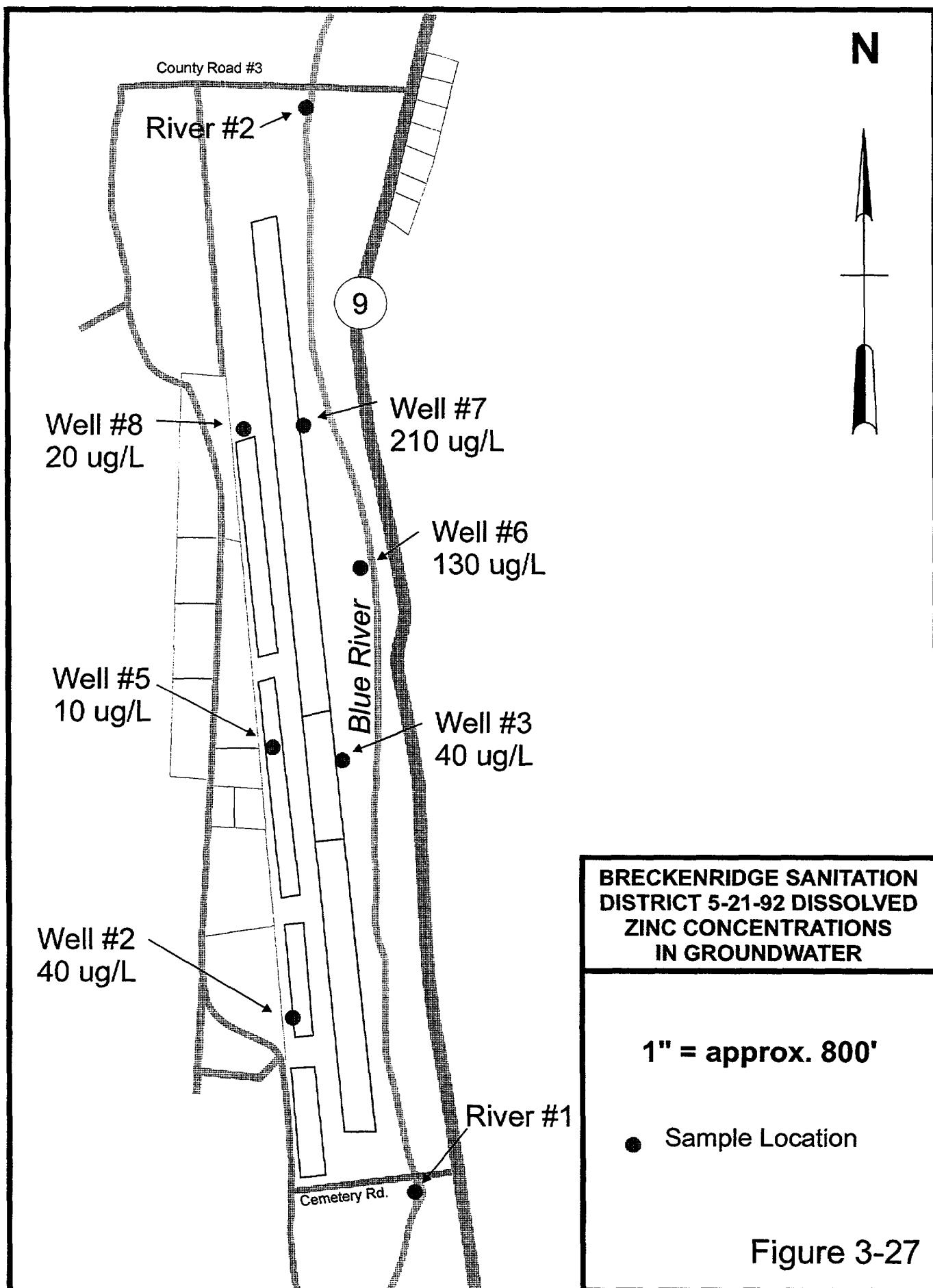


Figure 3-27

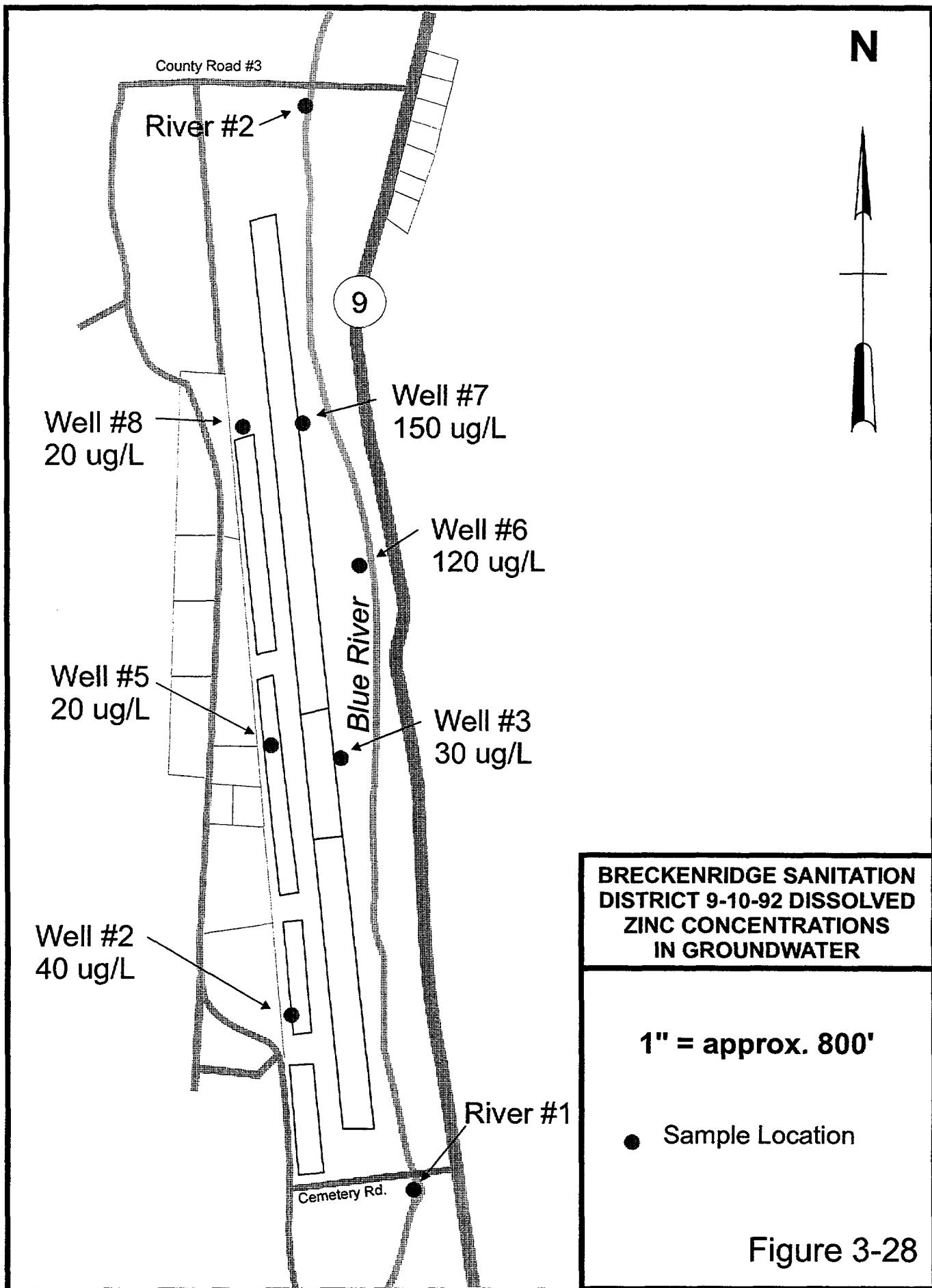


Figure 3-28

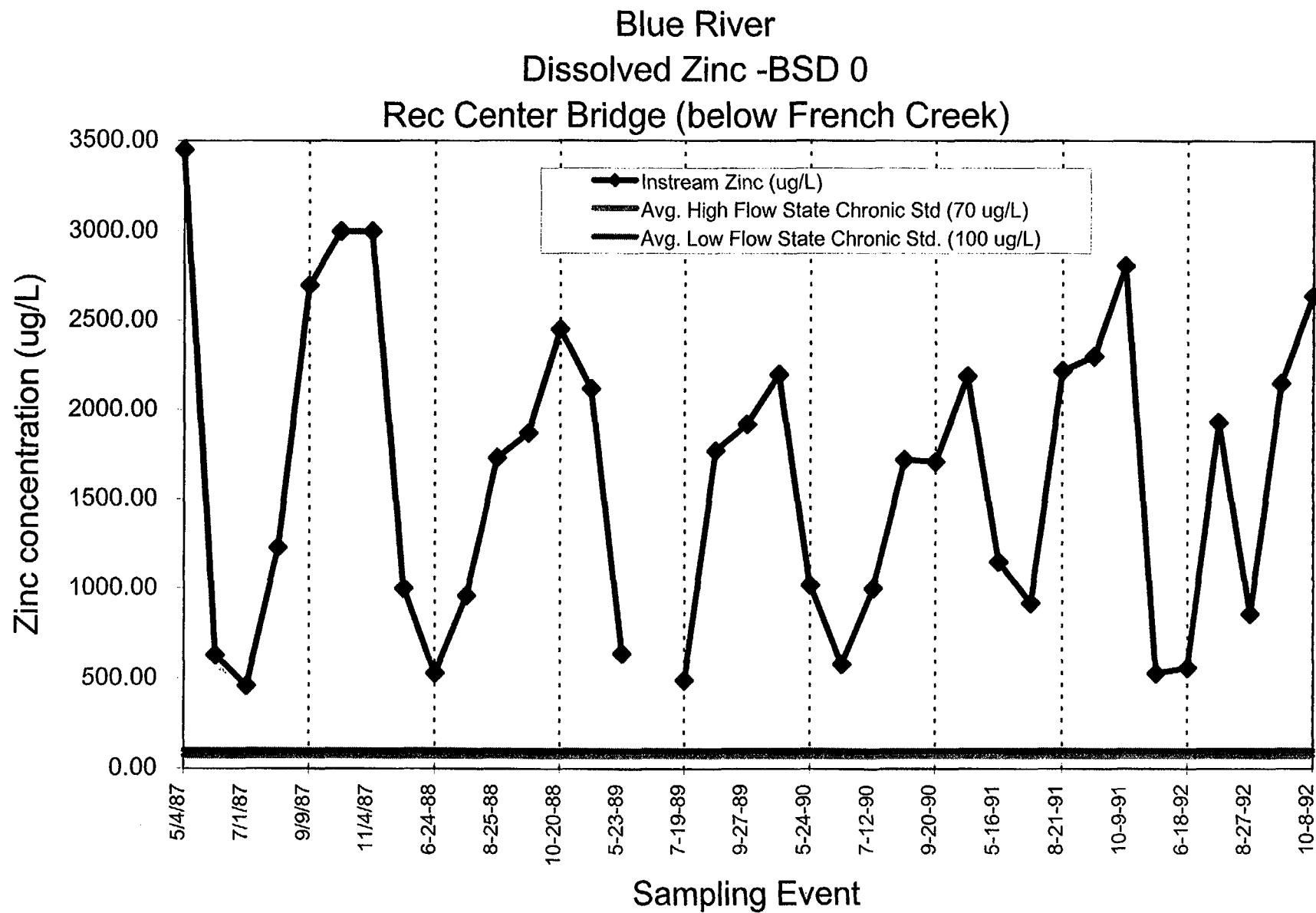


Figure 3-29

Blue River
Dissolved Zinc - BSD 2
County Road #3

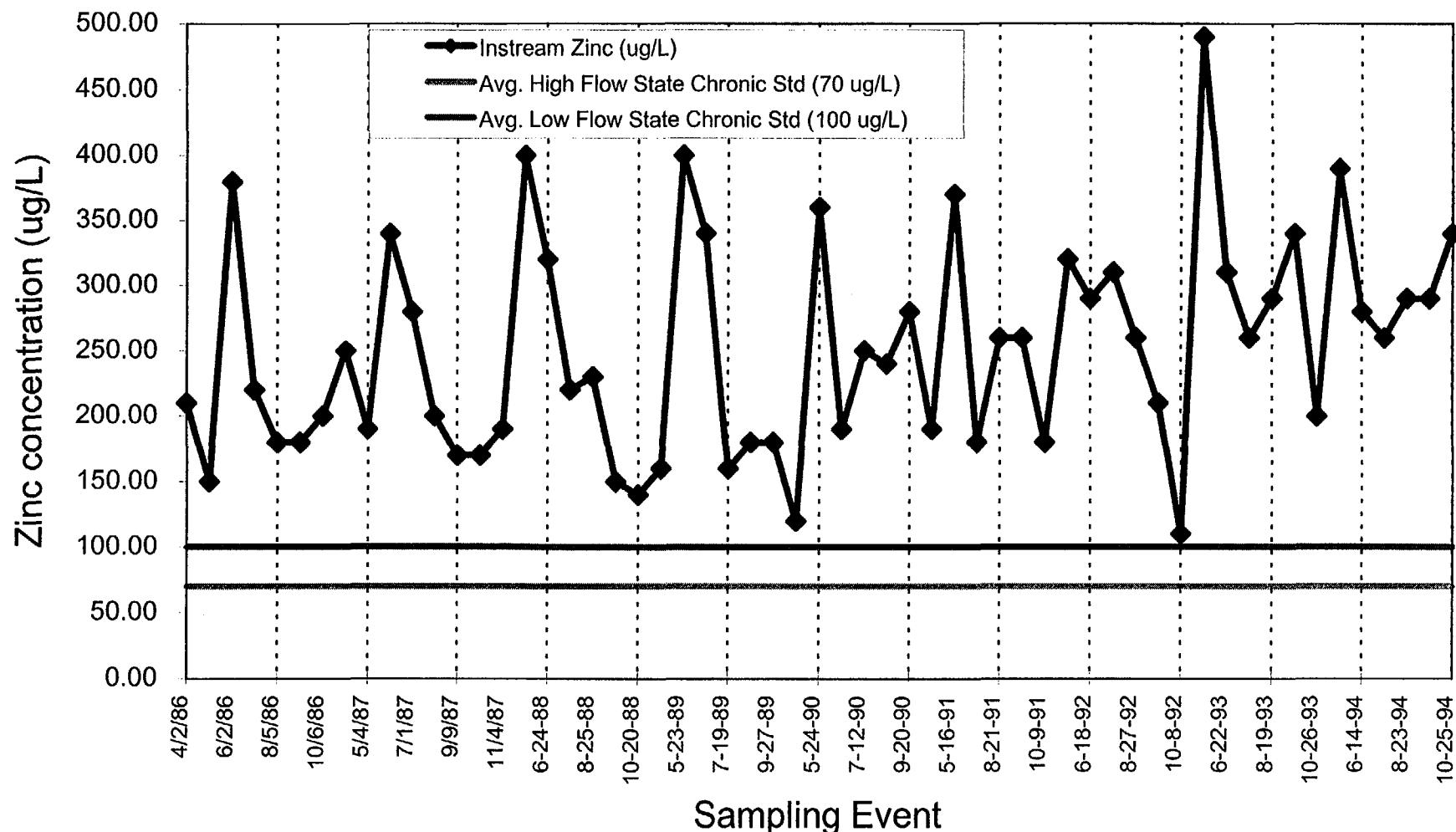


Figure 3-30

Background Groundwater Monitoring Wells pH

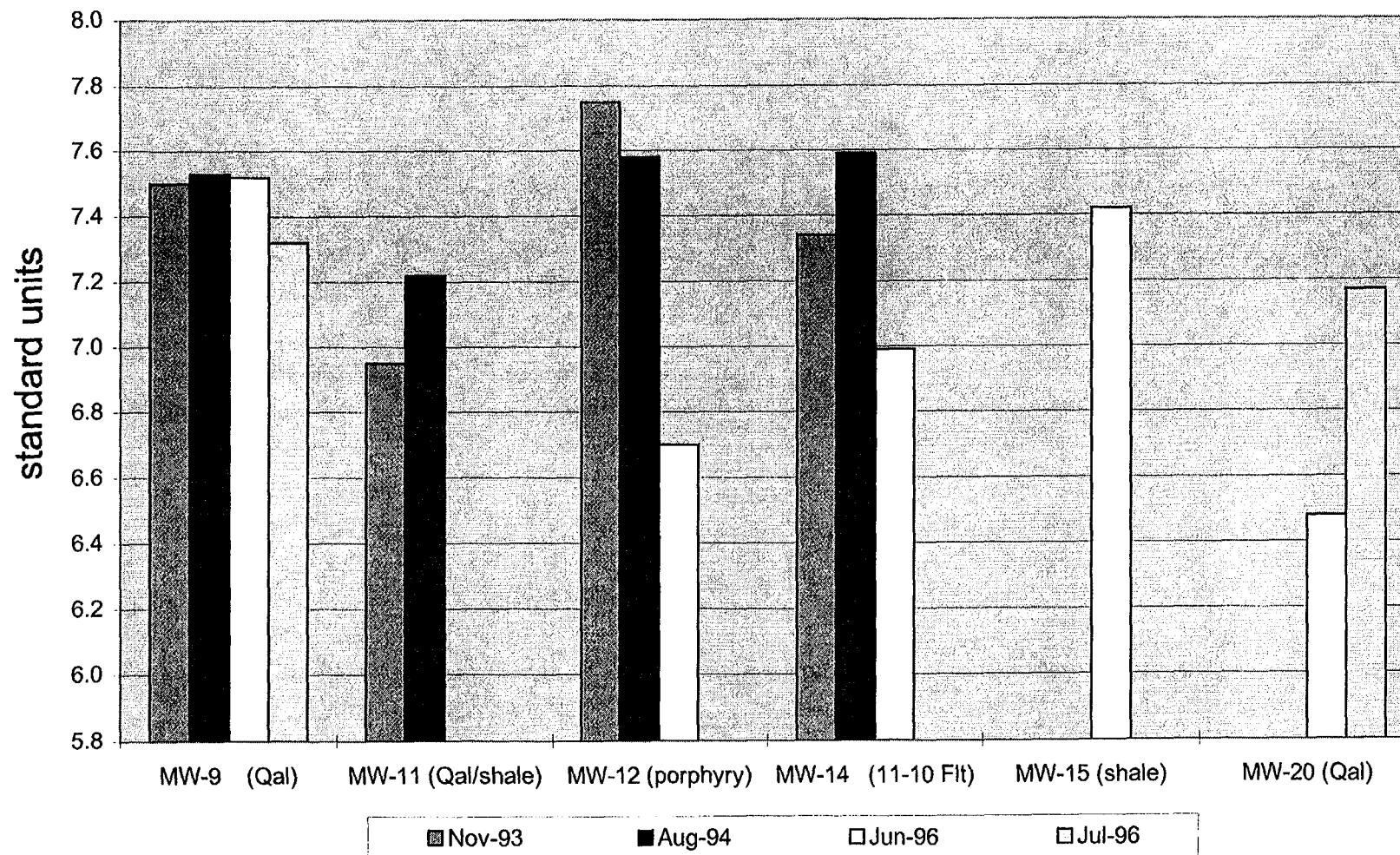


Figure 3-31a

Background Groundwater Monitoring Wells Total Recoverable Zinc

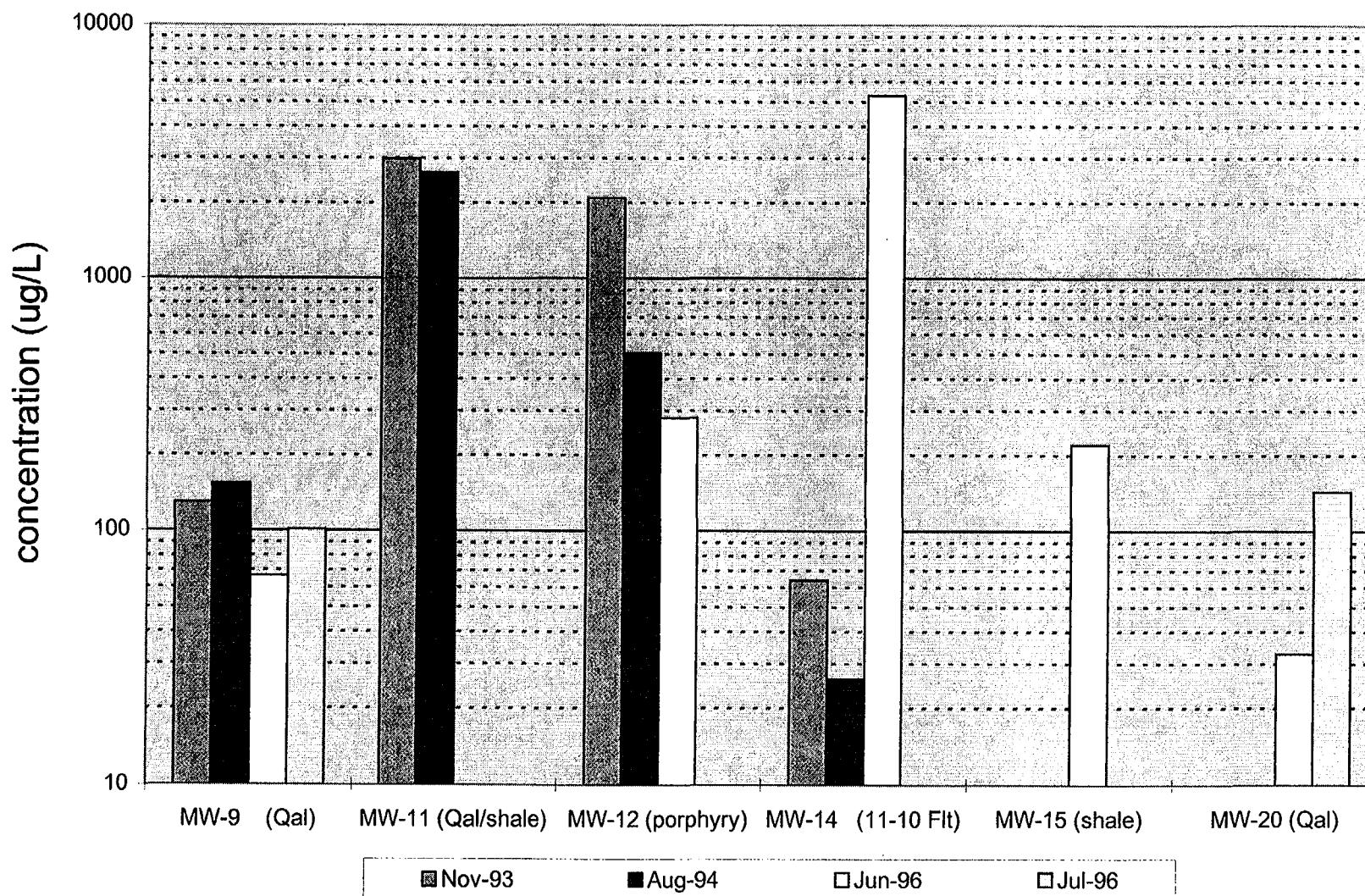


Figure 3-31b

Background Groundwater Monitoring Wells Total Recoverable Cadmium

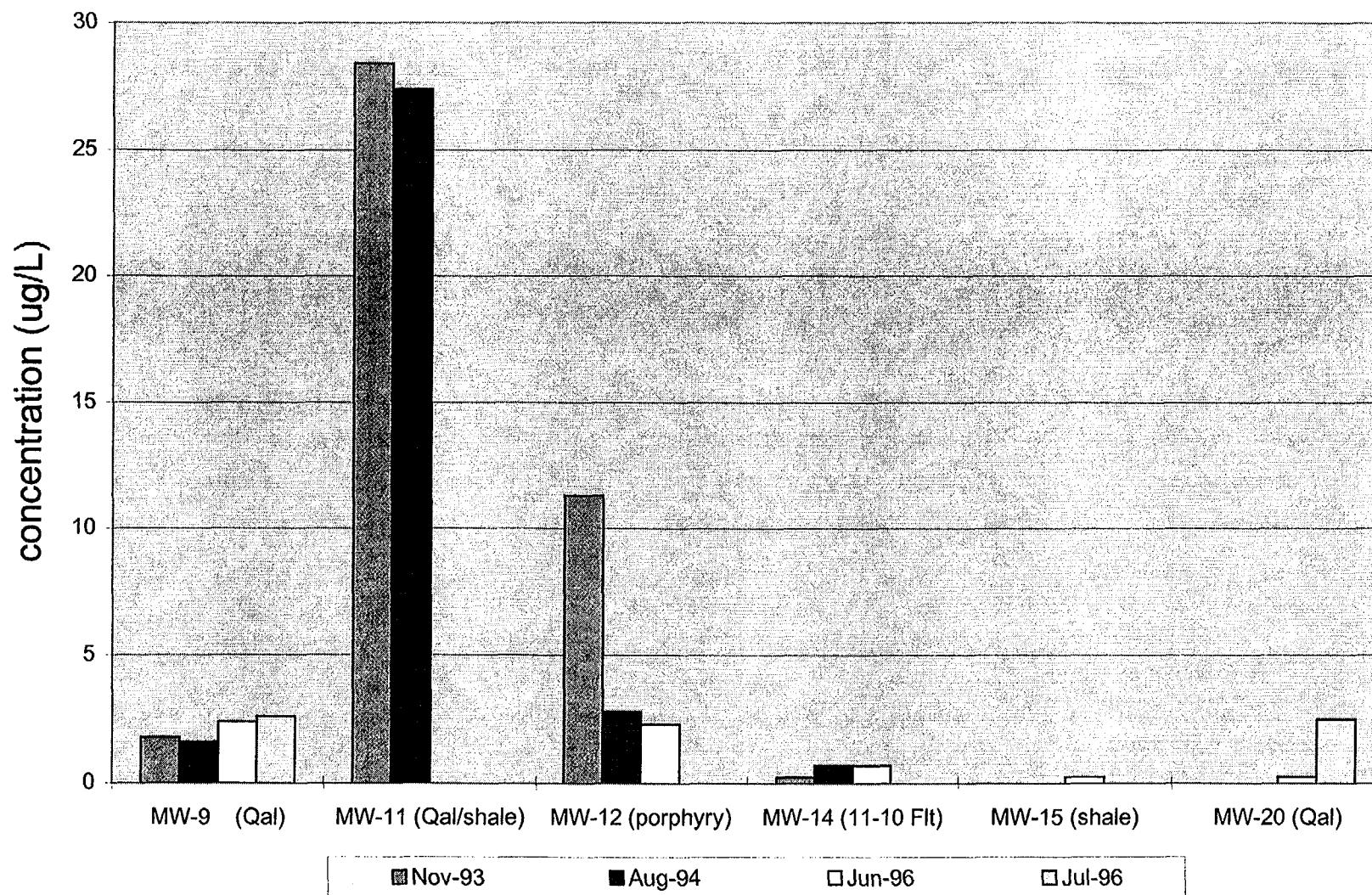


Figure 3-31c

Background Groundwater Monitoring Wells Total Recoverable Iron

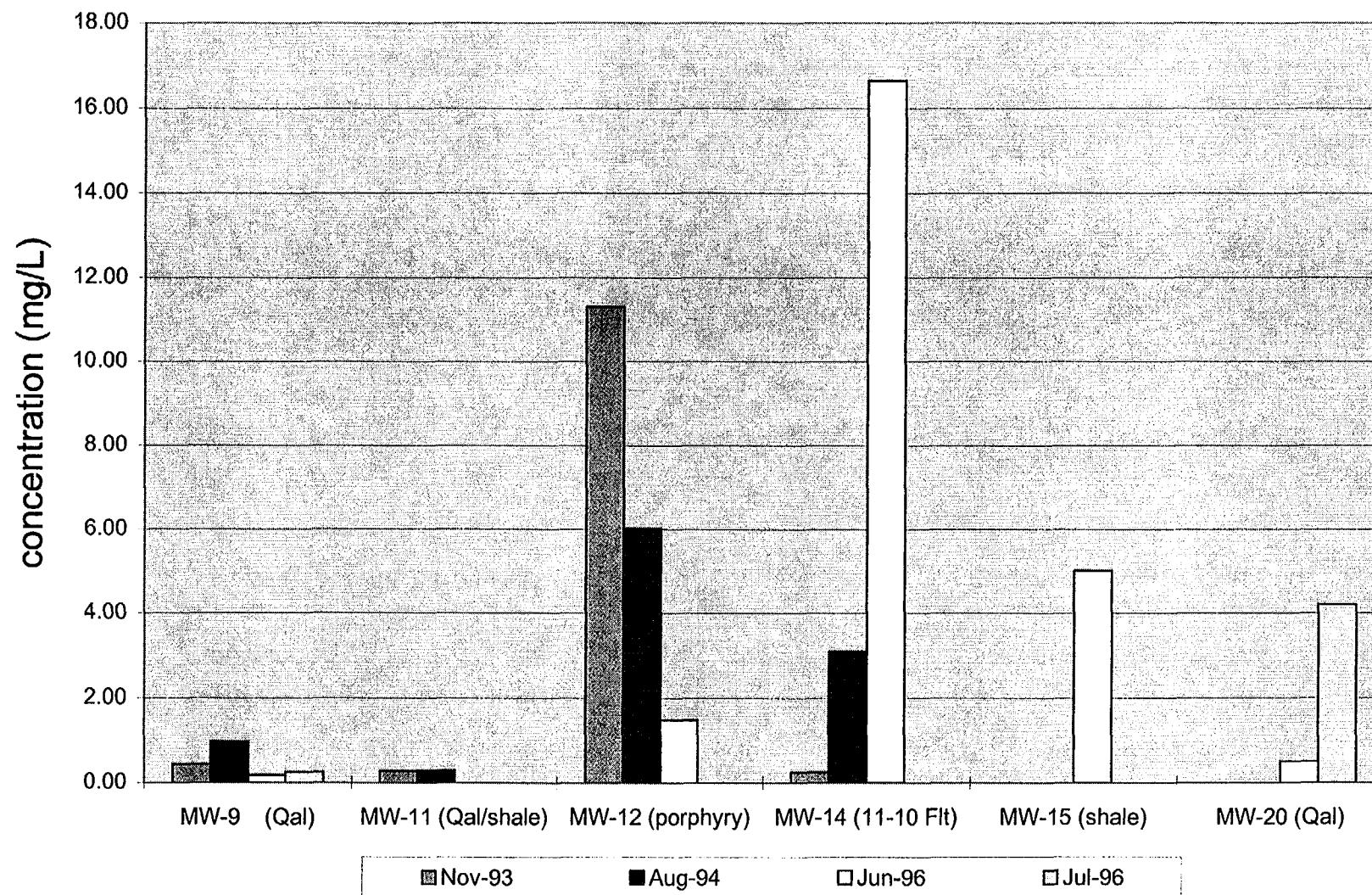


Figure 3-31d

Background Groundwater Monitoring Wells Total Recoverable Lead

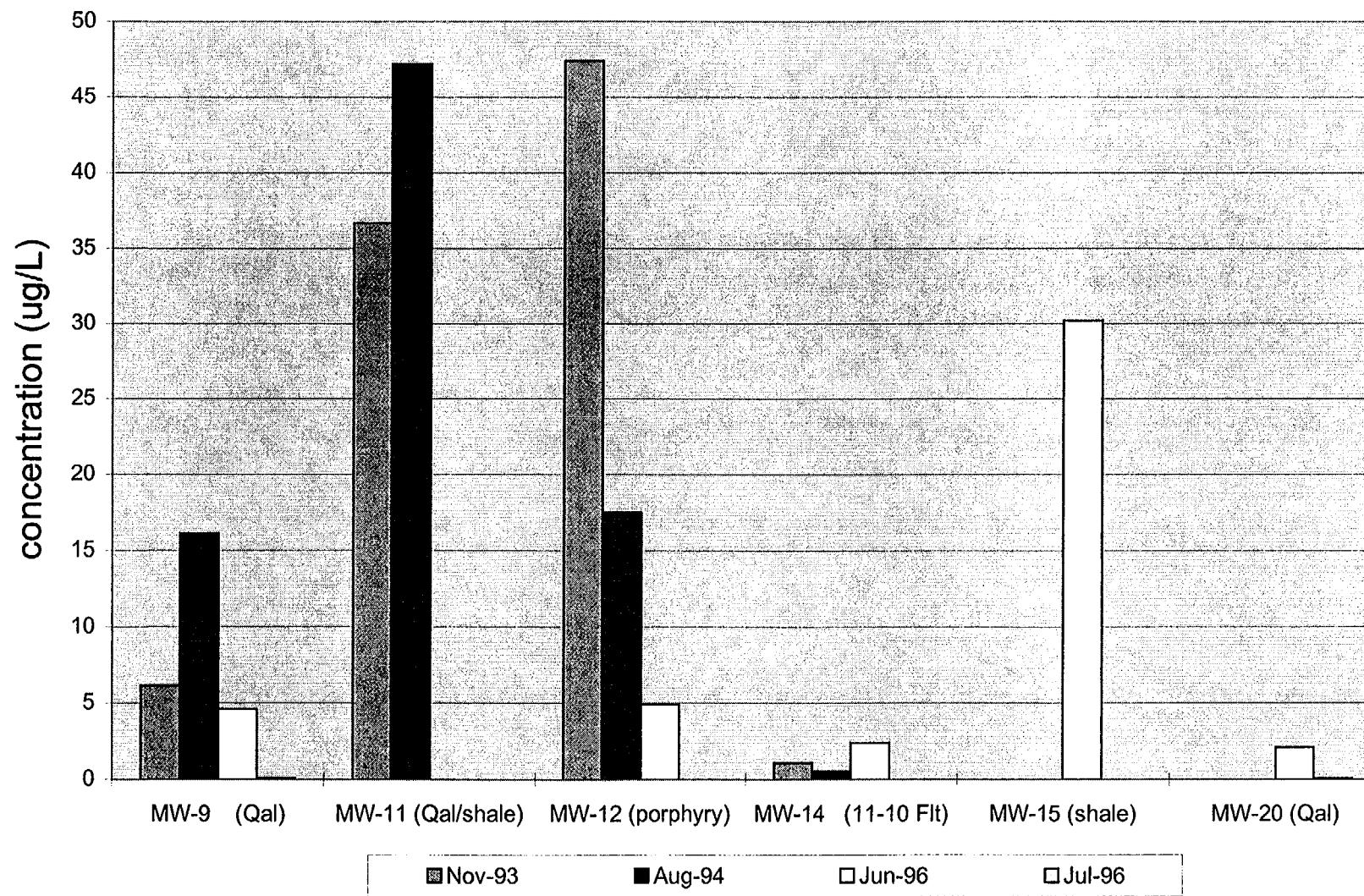


Figure 3-31e

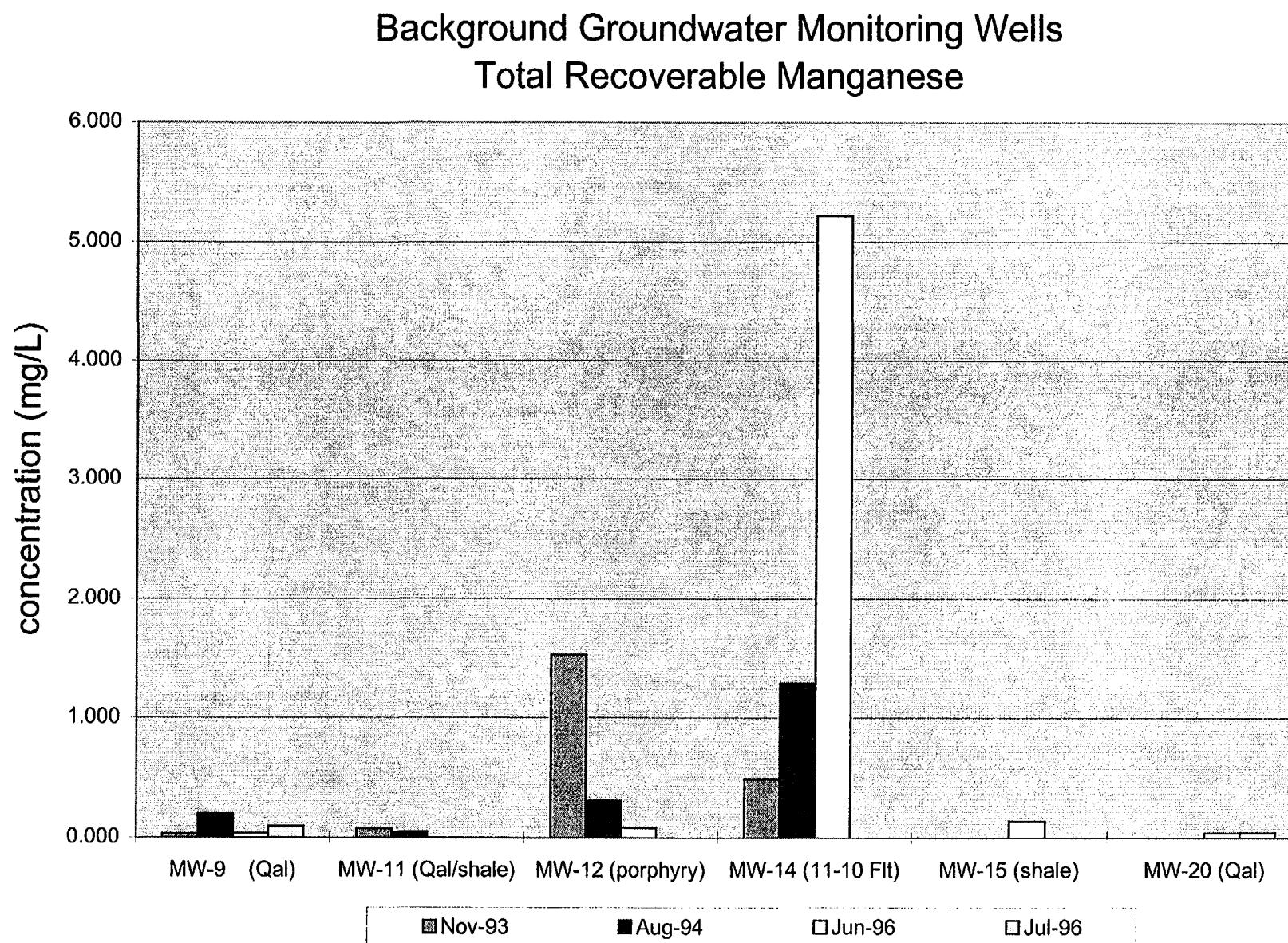


Figure 3-31f

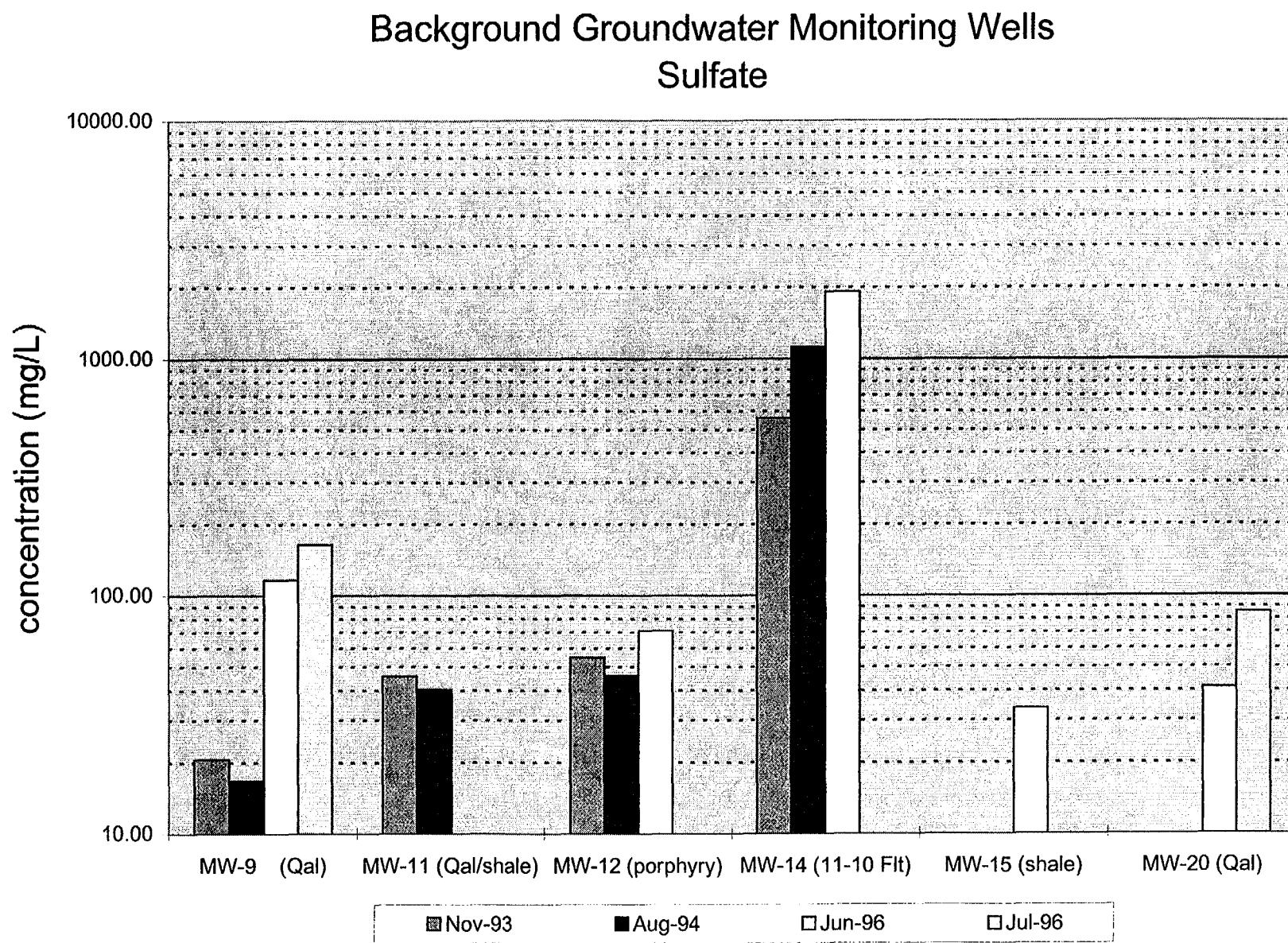


Figure 3-31g

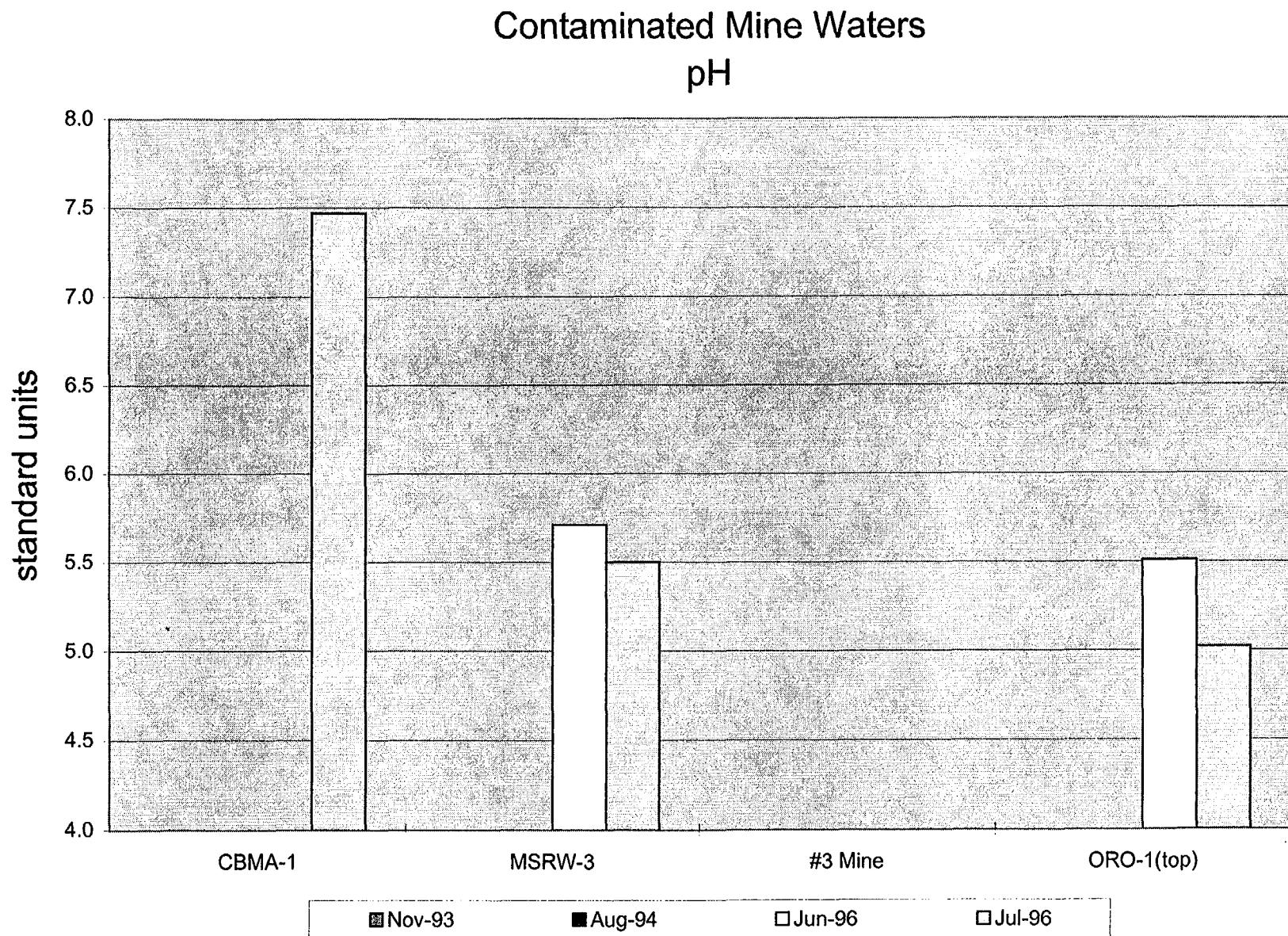


Figure 3-32a

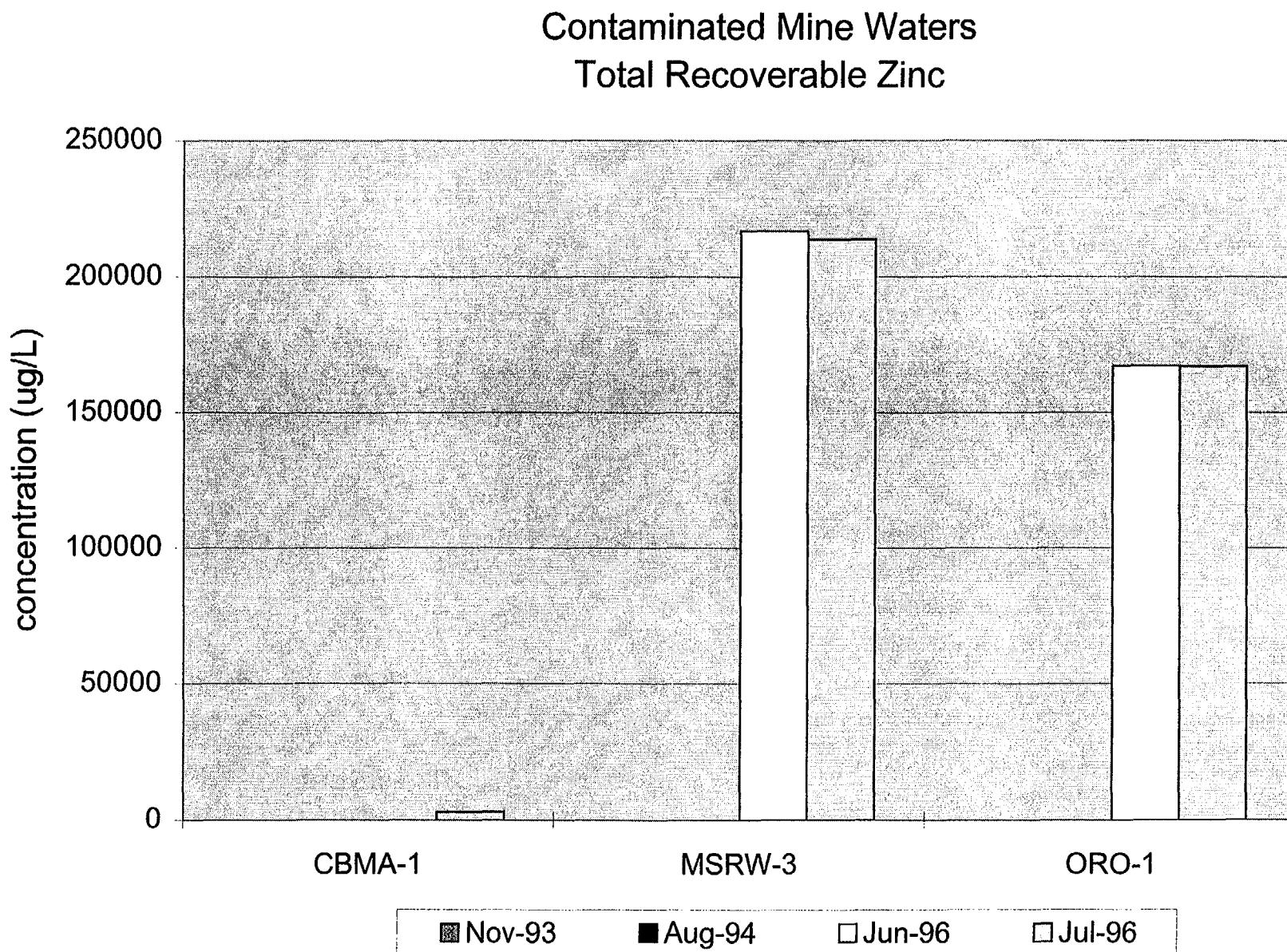


Figure 3-32b

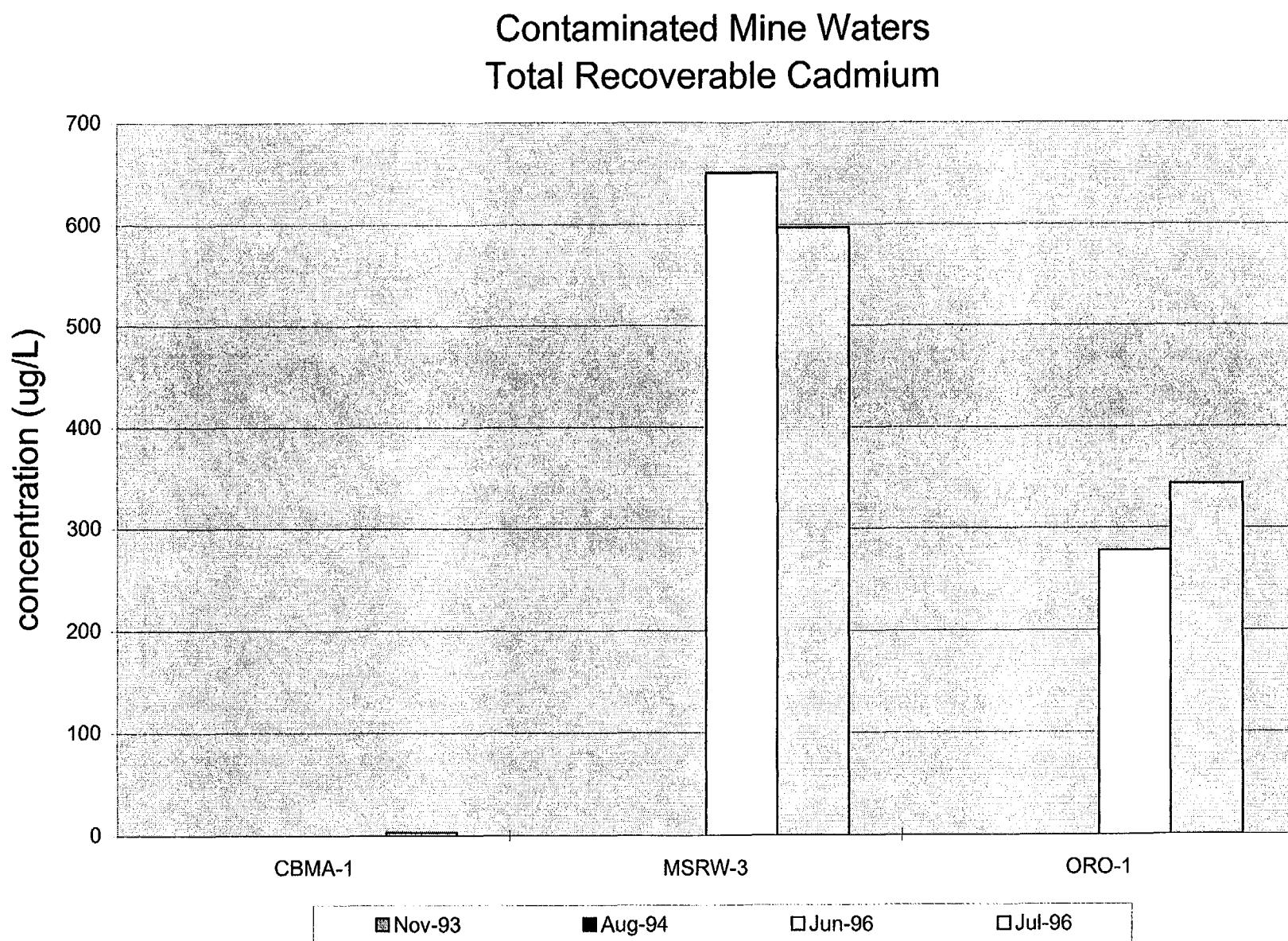


Figure 3-32c

Contaminated Mine Waters Total Recoverable Iron

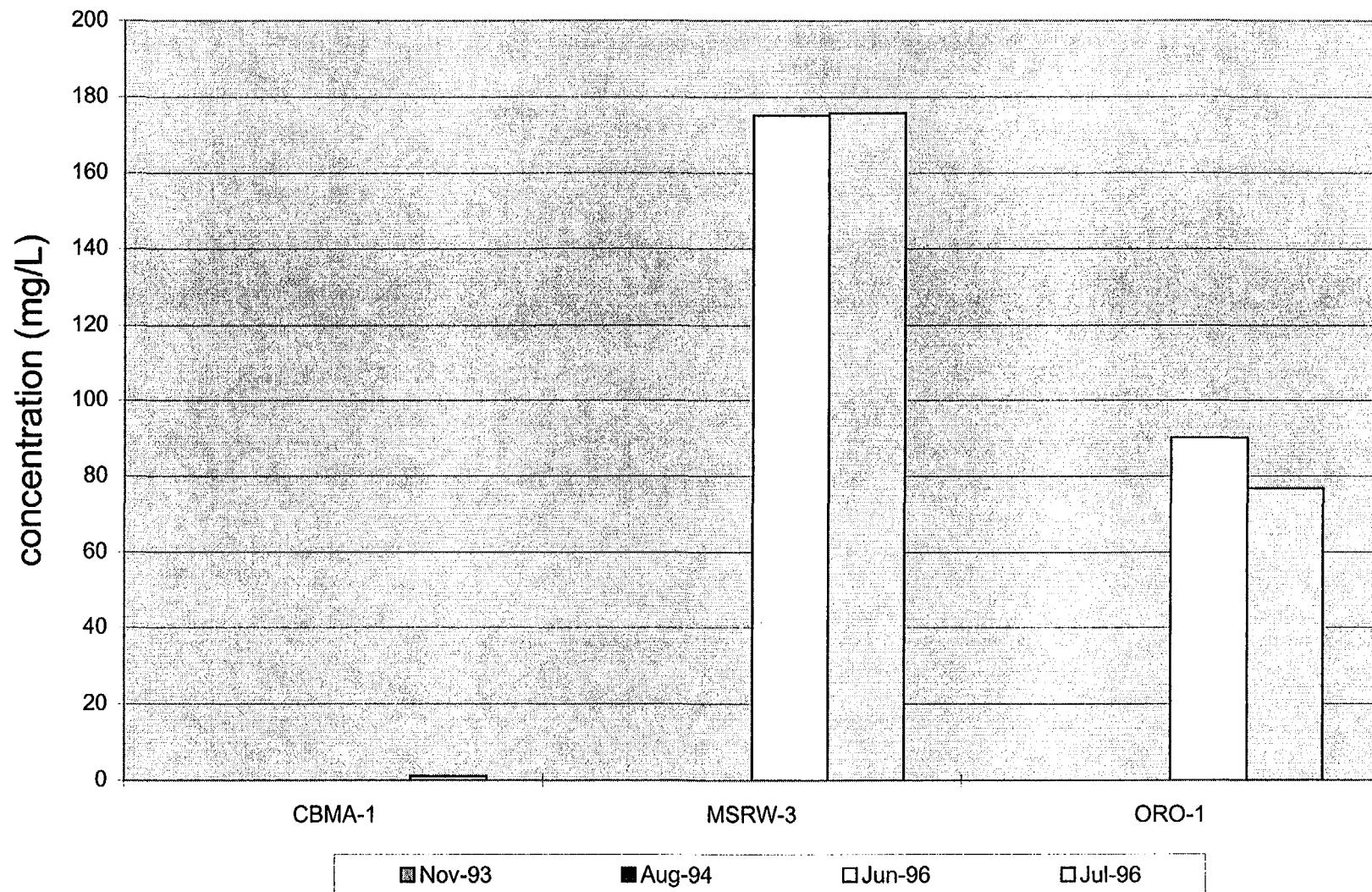


Figure 3-32d

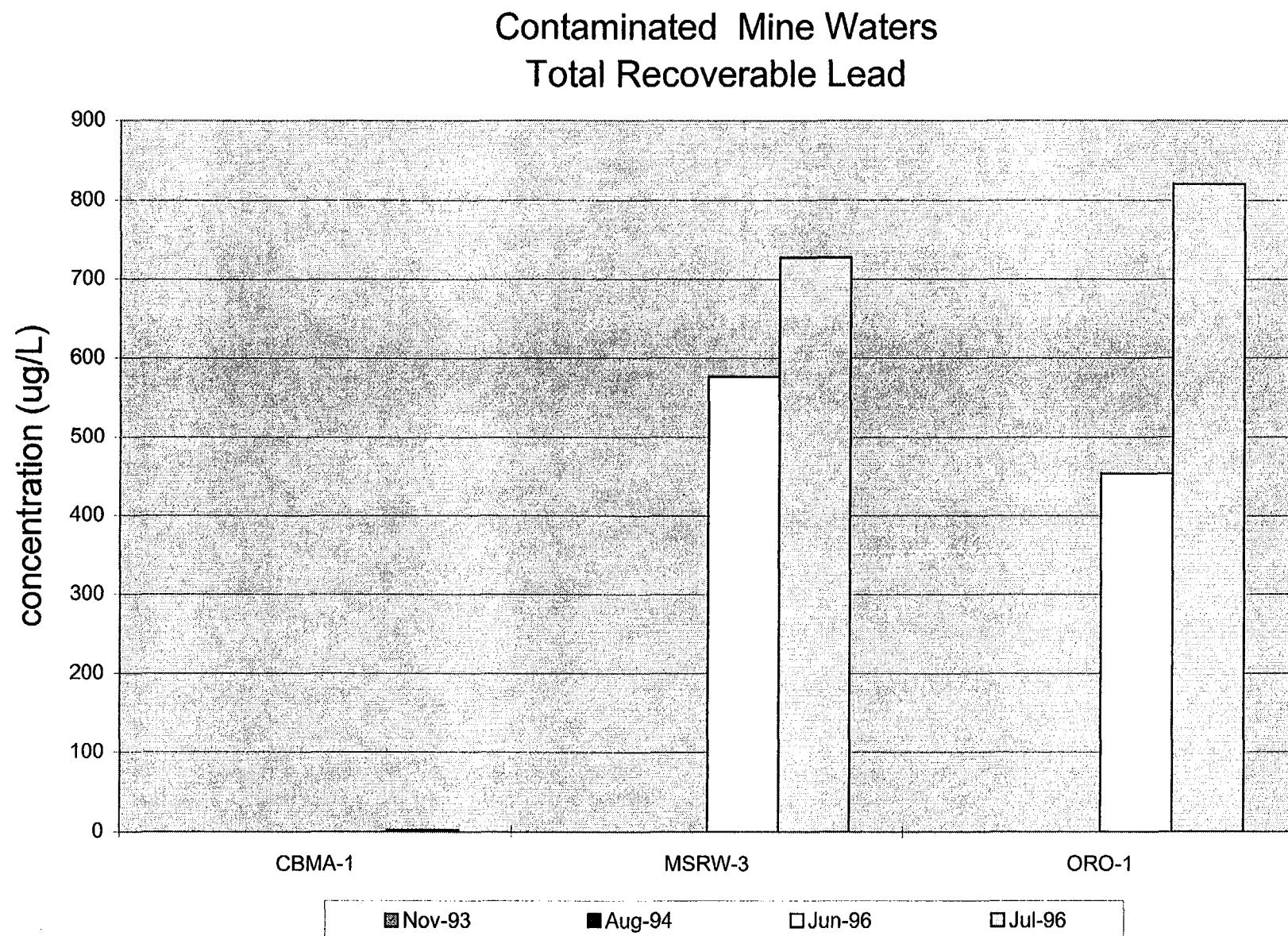


Figure 3-32e

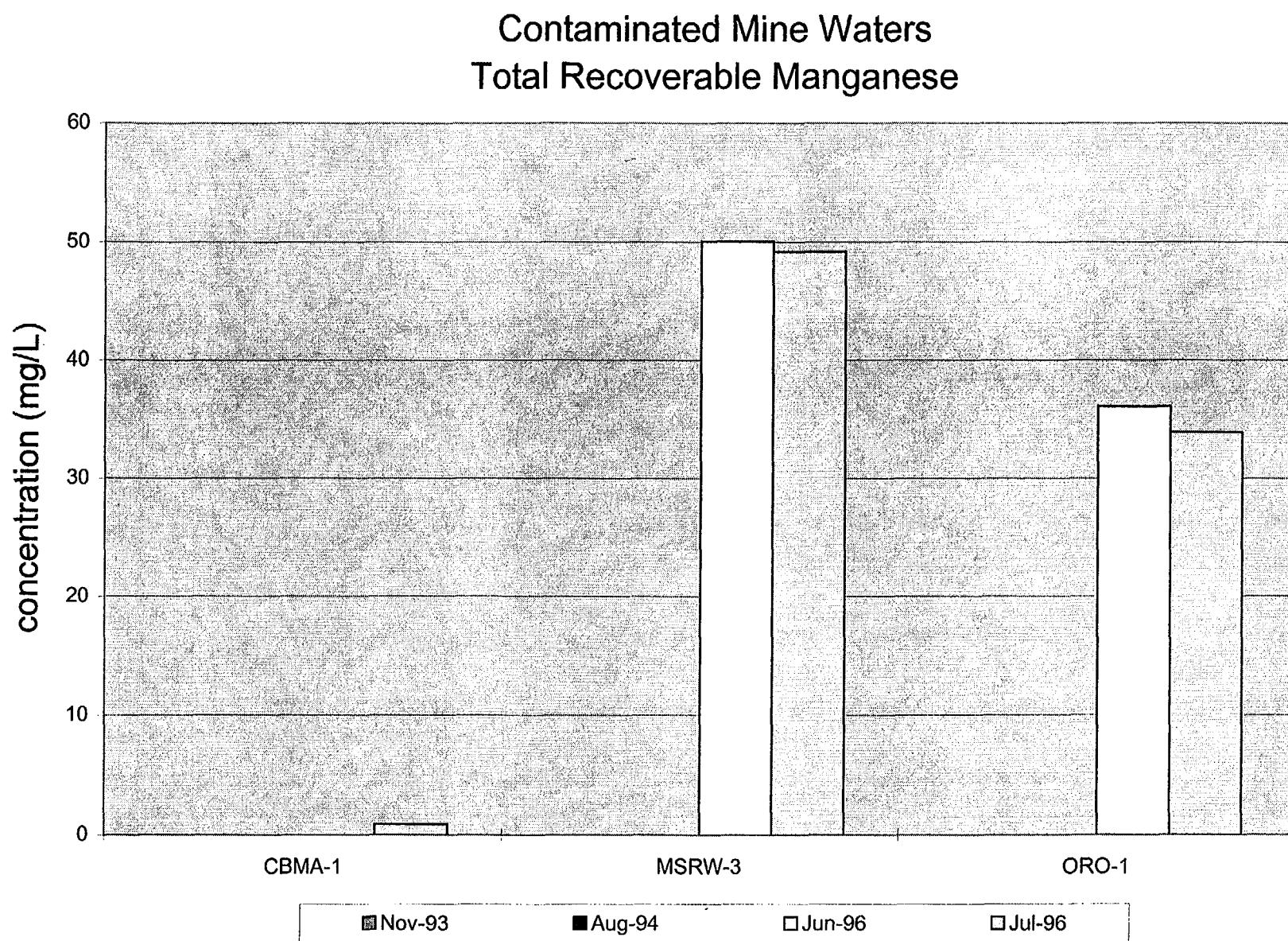


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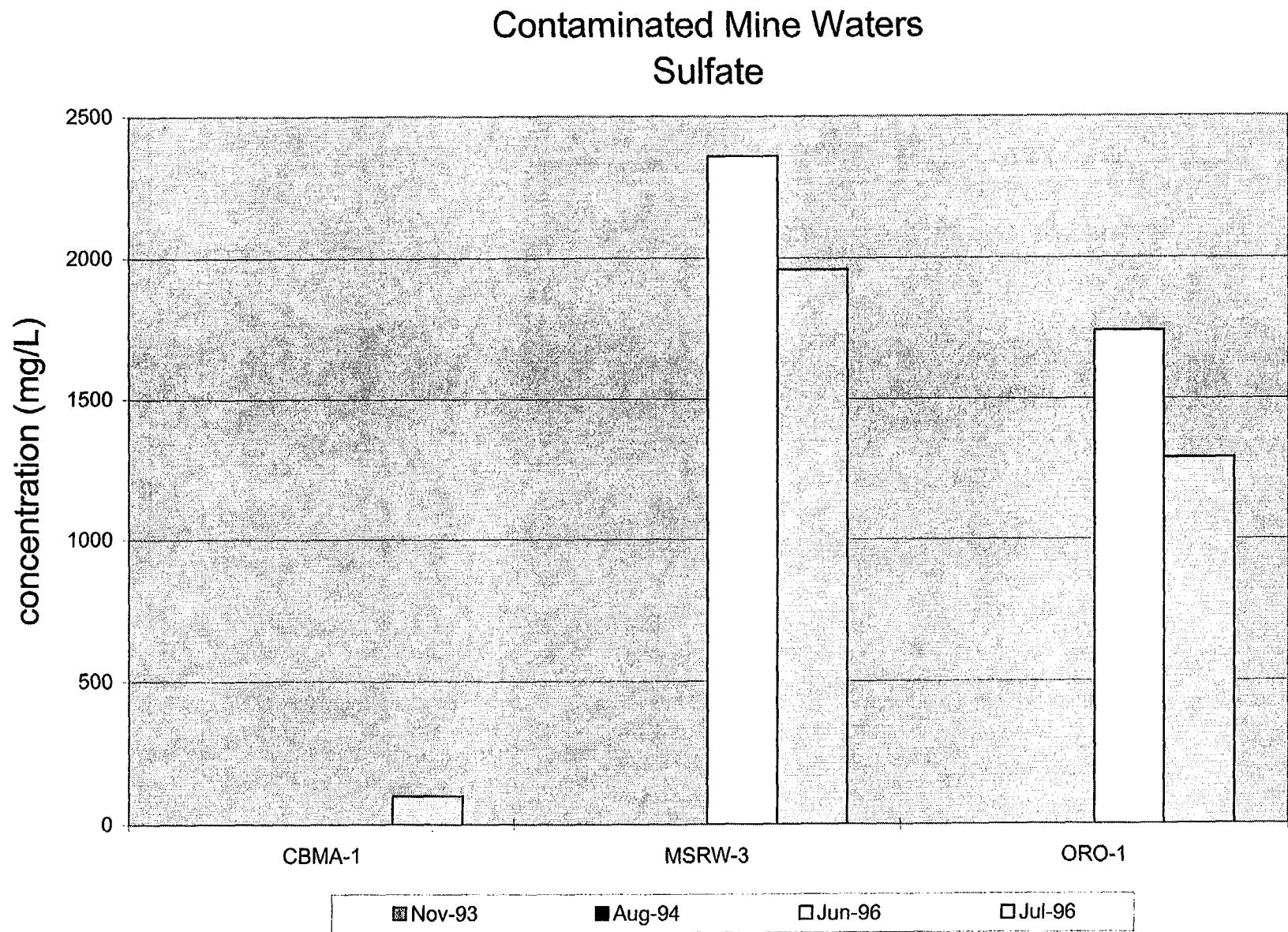


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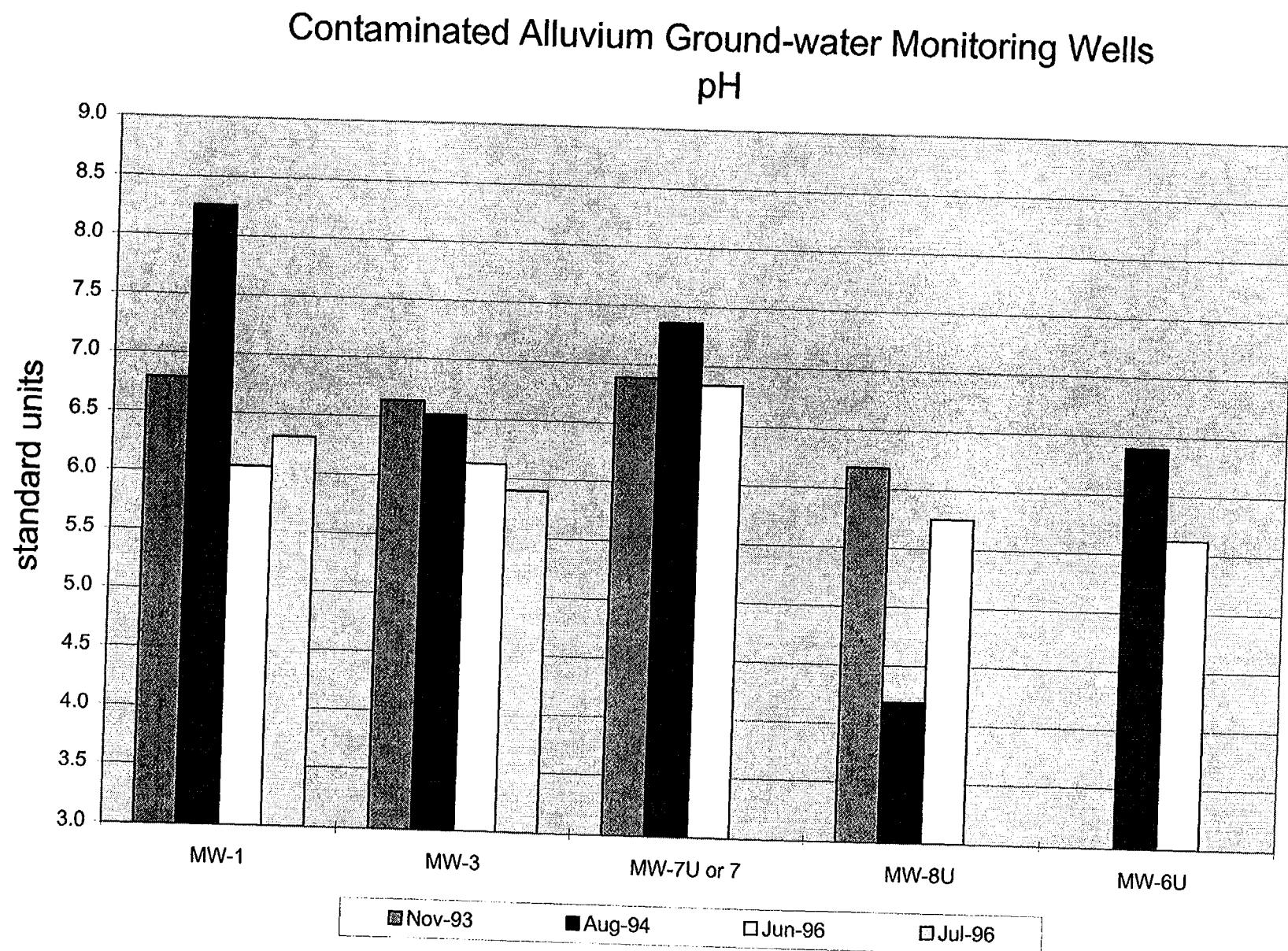


Figure 3-33a

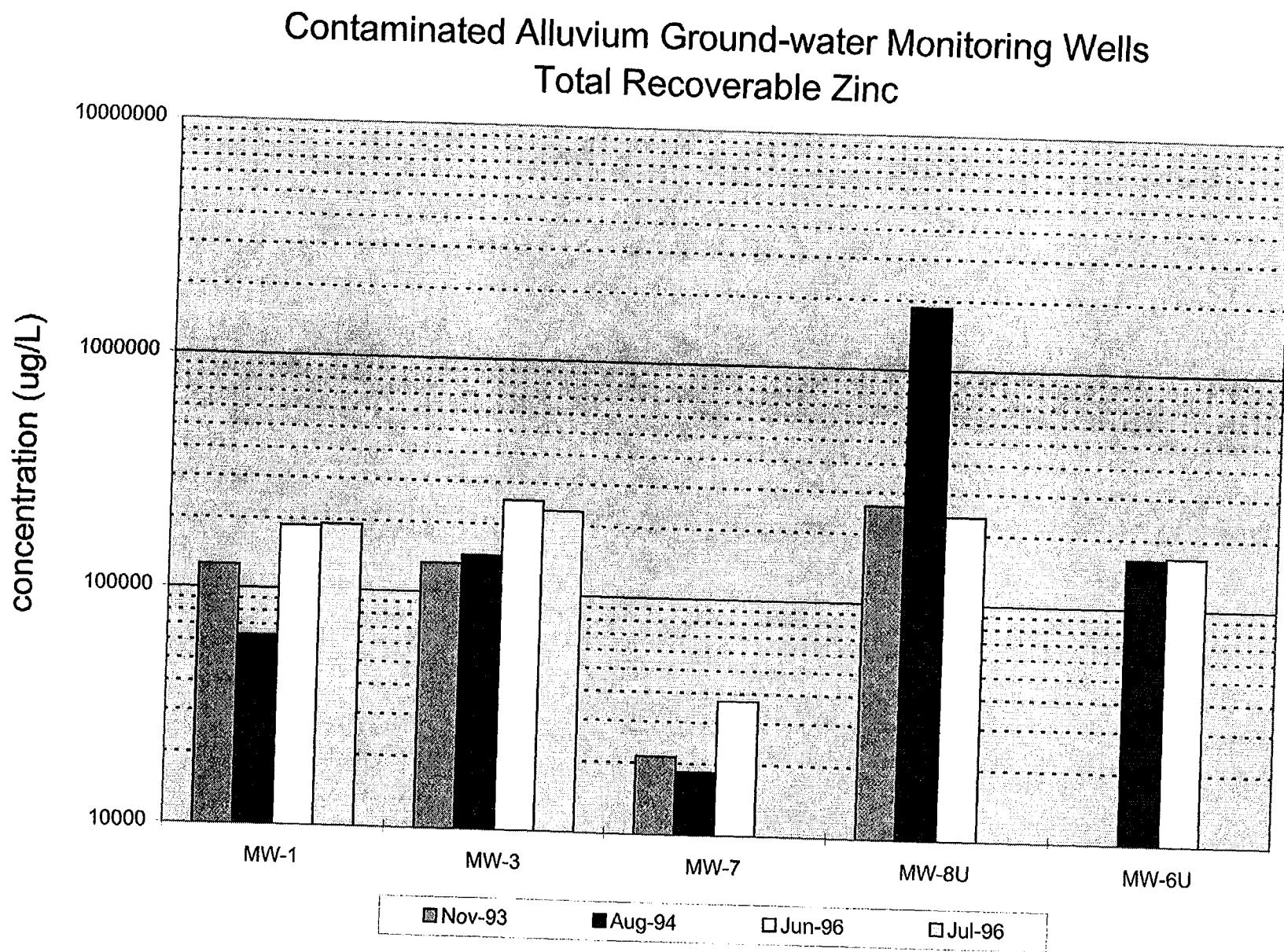


Figure 3-33b

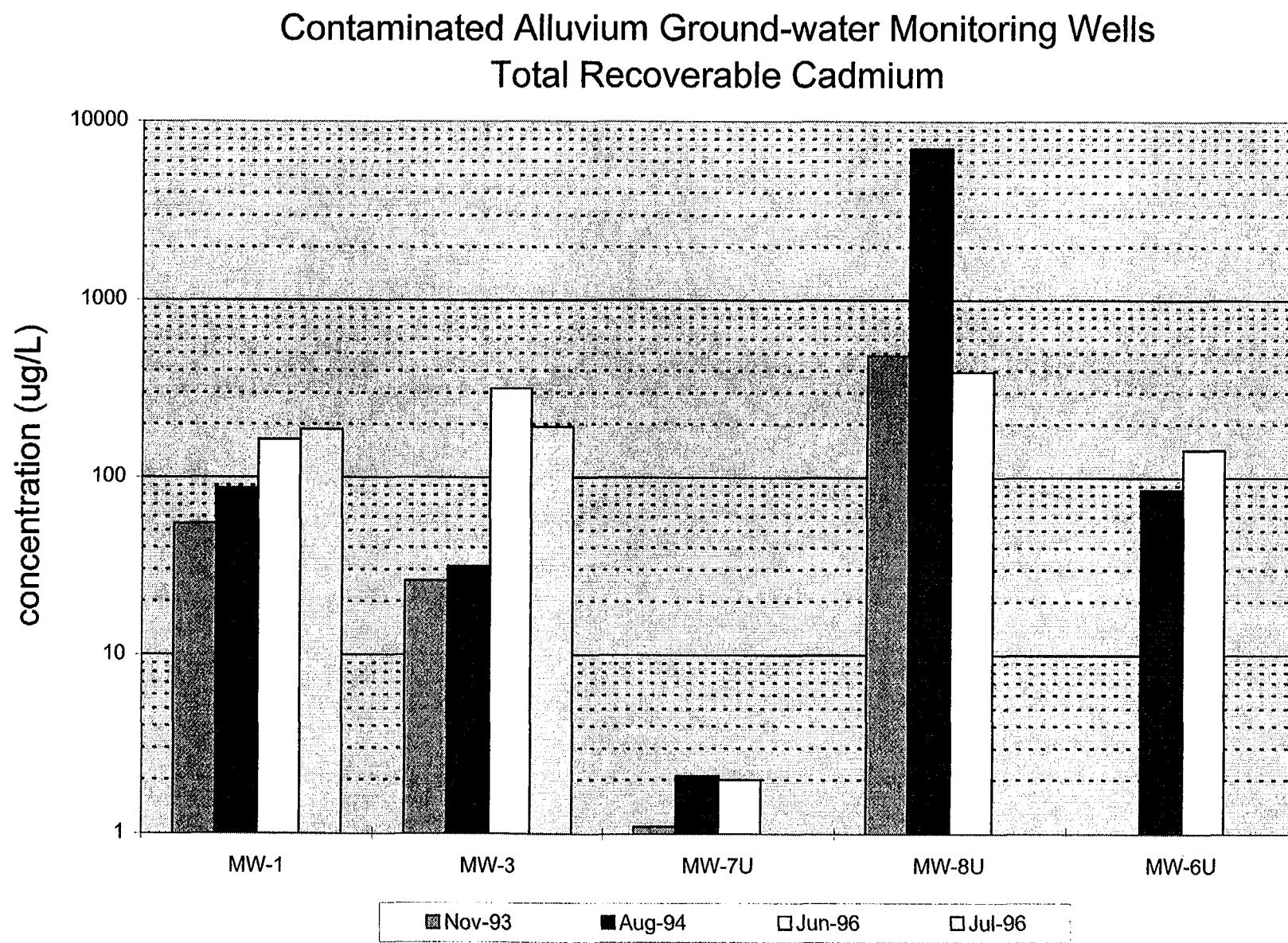


Figure 3-33c

Contaminated Alluvium Ground-water Monitoring Wells
Total Recoverable Iron

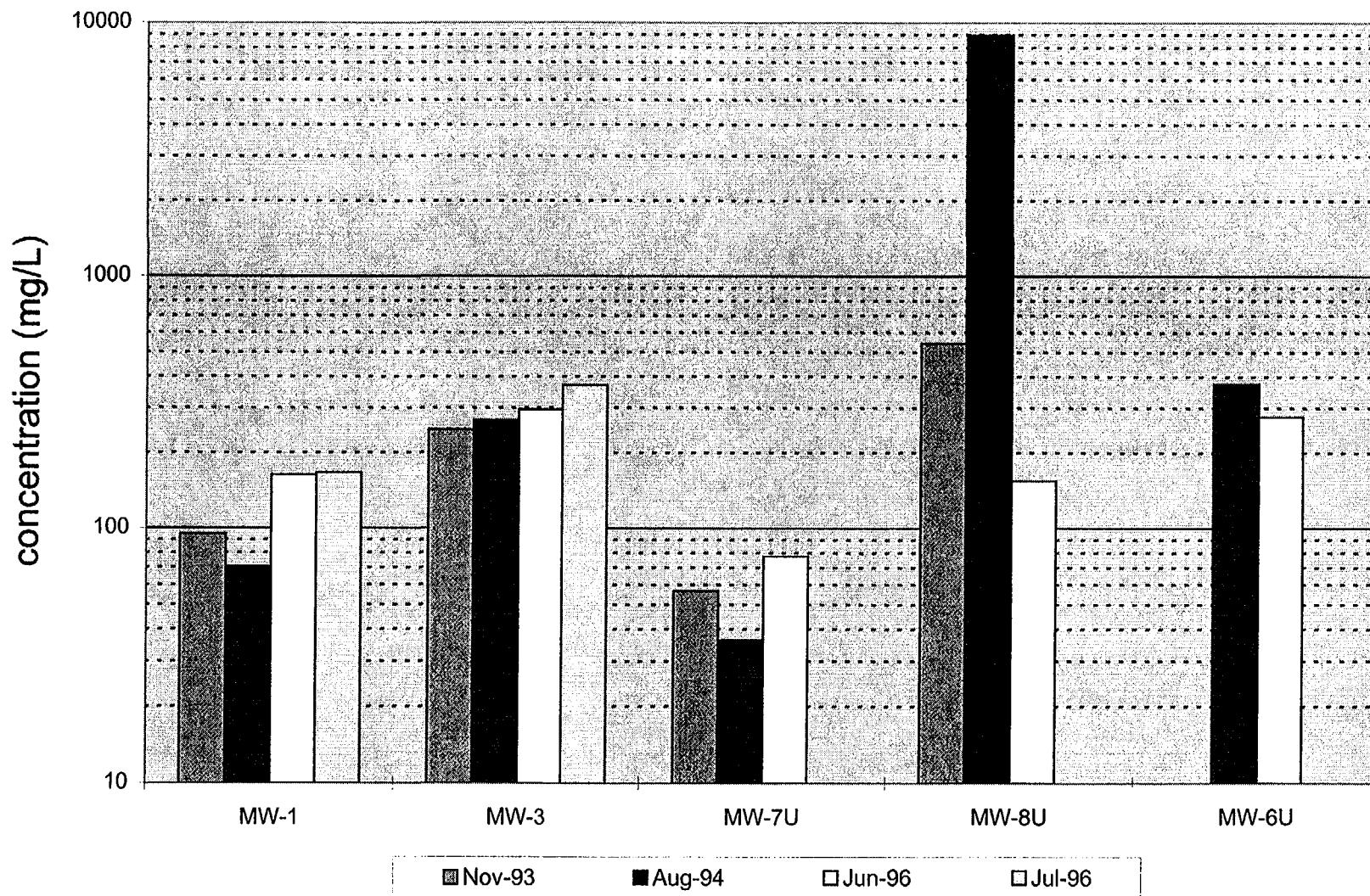


Figure 3-33d

Contaminated Alluvium Ground-water Monitoring Wells Total Recoverable Lead

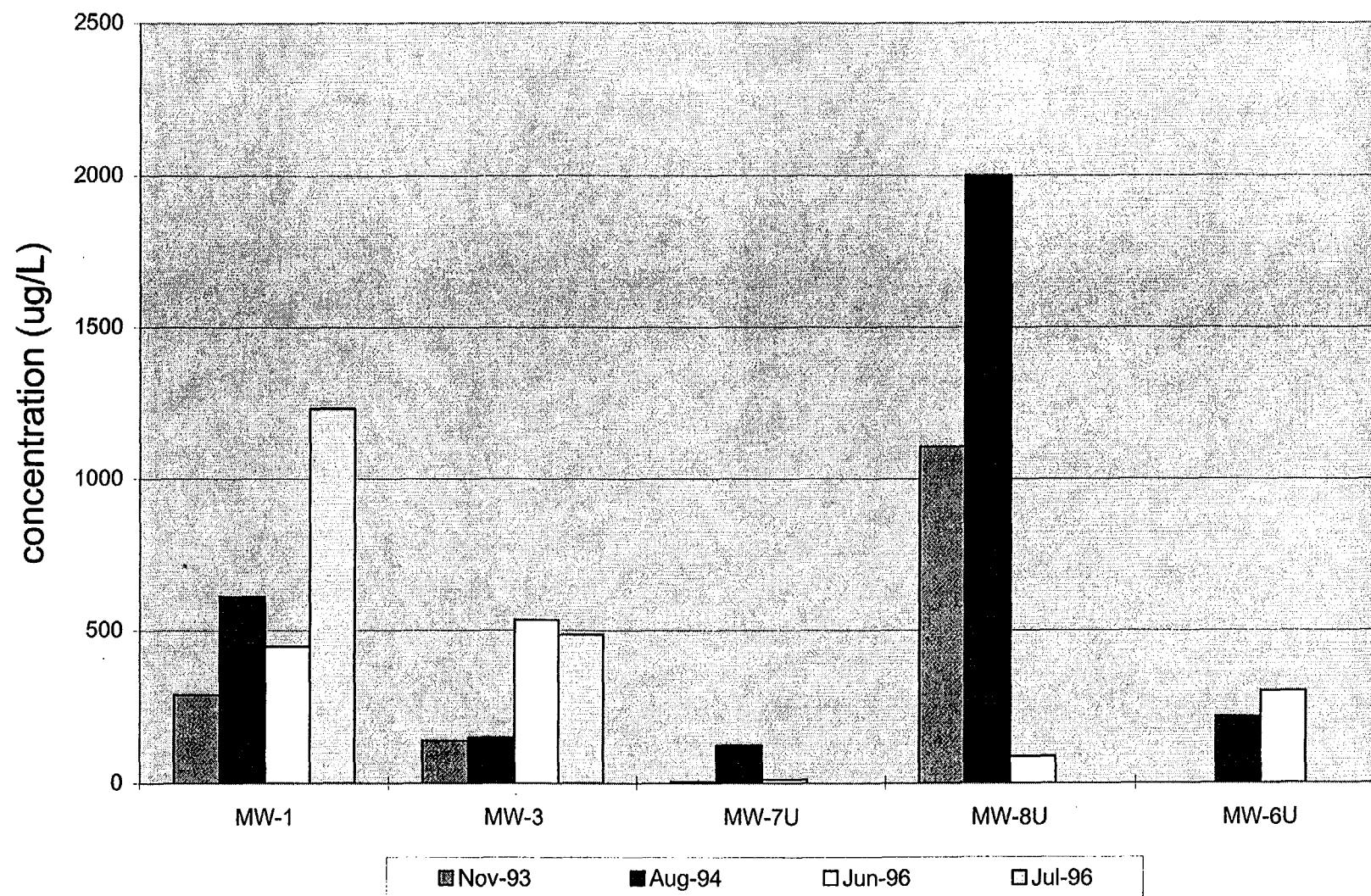


Figure 3-33e

Contaminated Alluvium Ground-water Monitoring Wells Total Recoverable Manganese

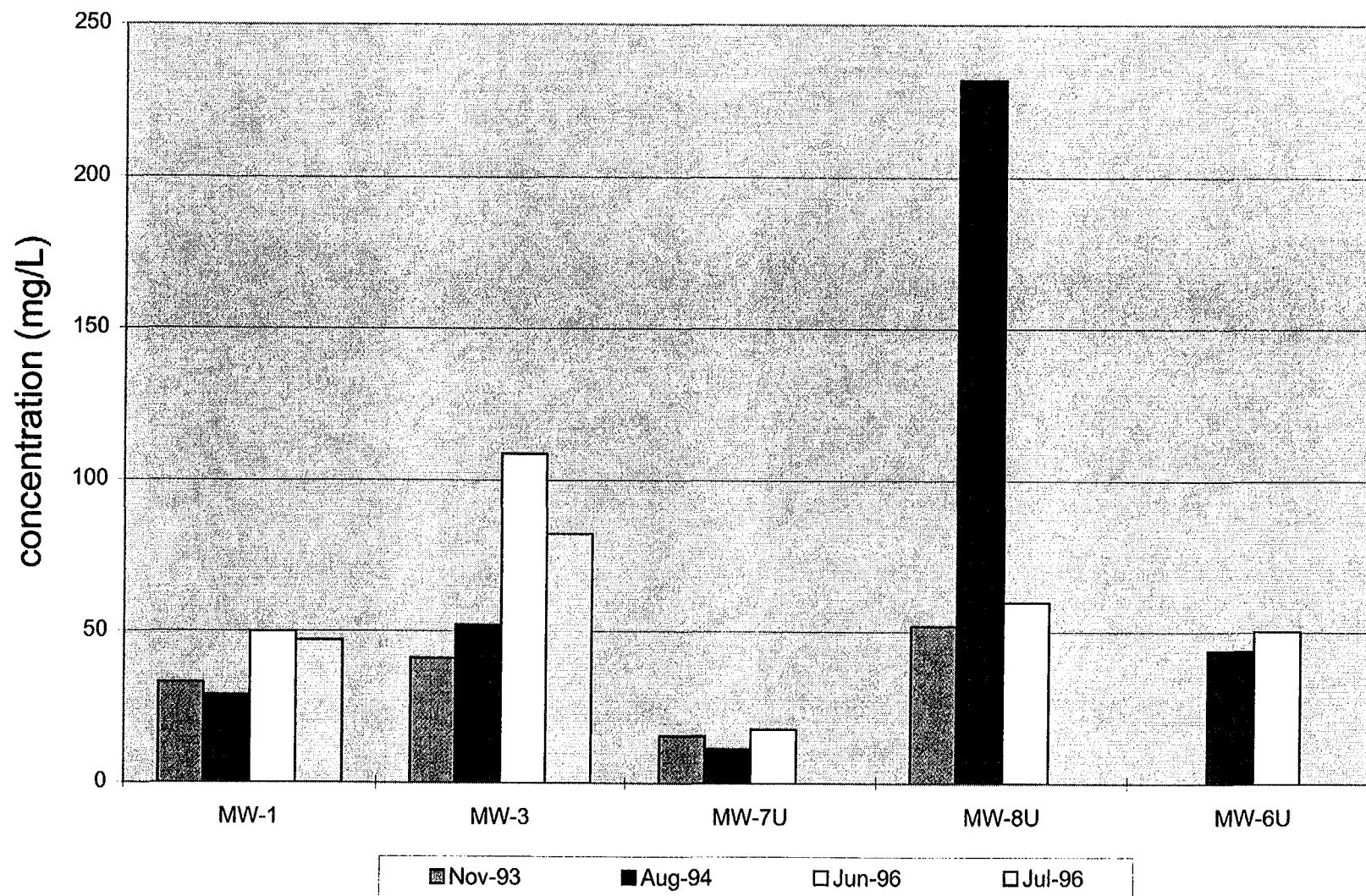


Figure 3-33f

Contaminated Alluvium Ground-water Monitoring Wells Sulfate

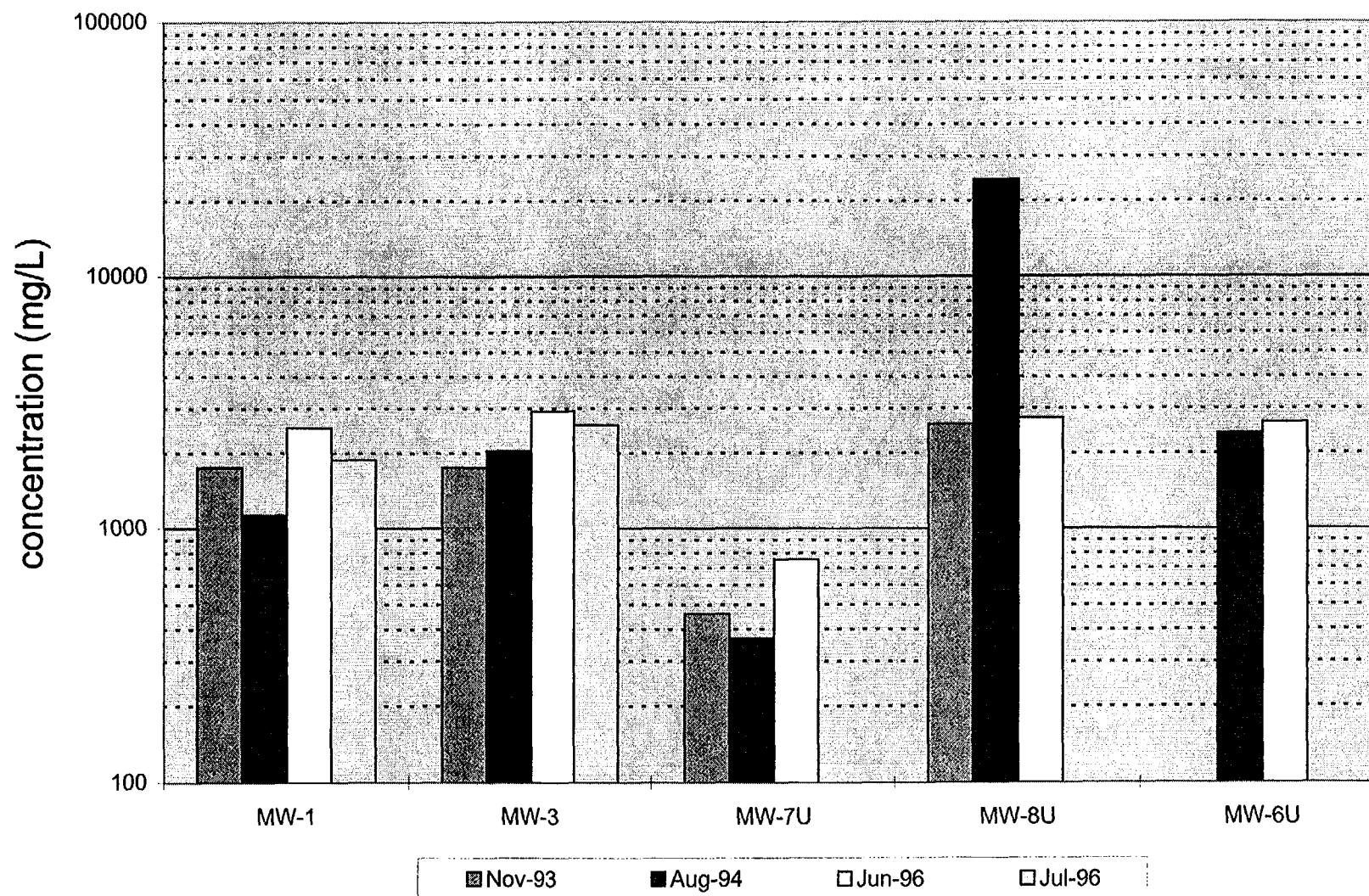


Figure 3-33g

Contaminated Bedrock Ground-water Monitoring Wells pH

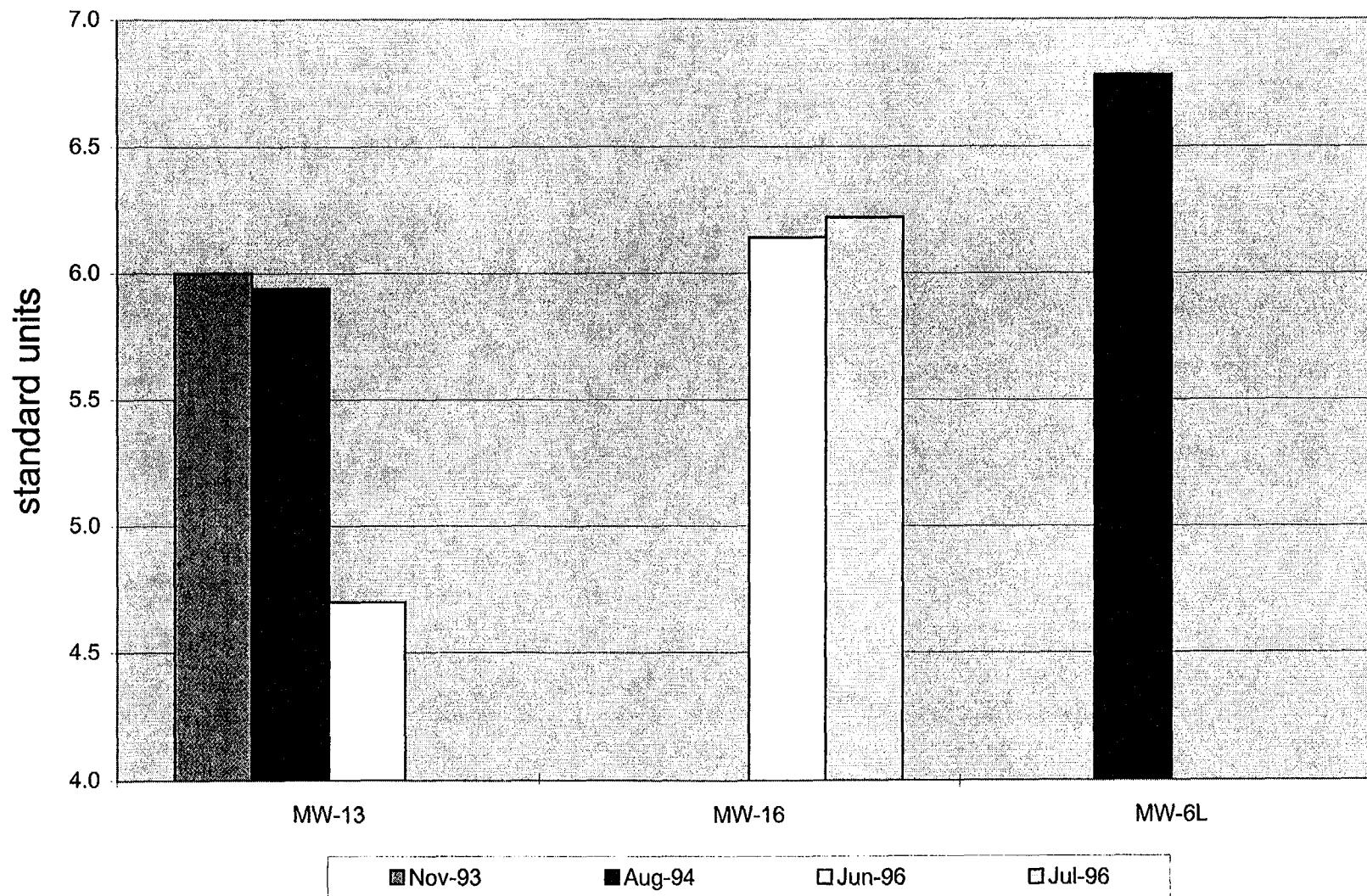


Figure 3-34a

Contaminated Bedrock Ground-water Monitoring Wells Total Recoverable Zinc

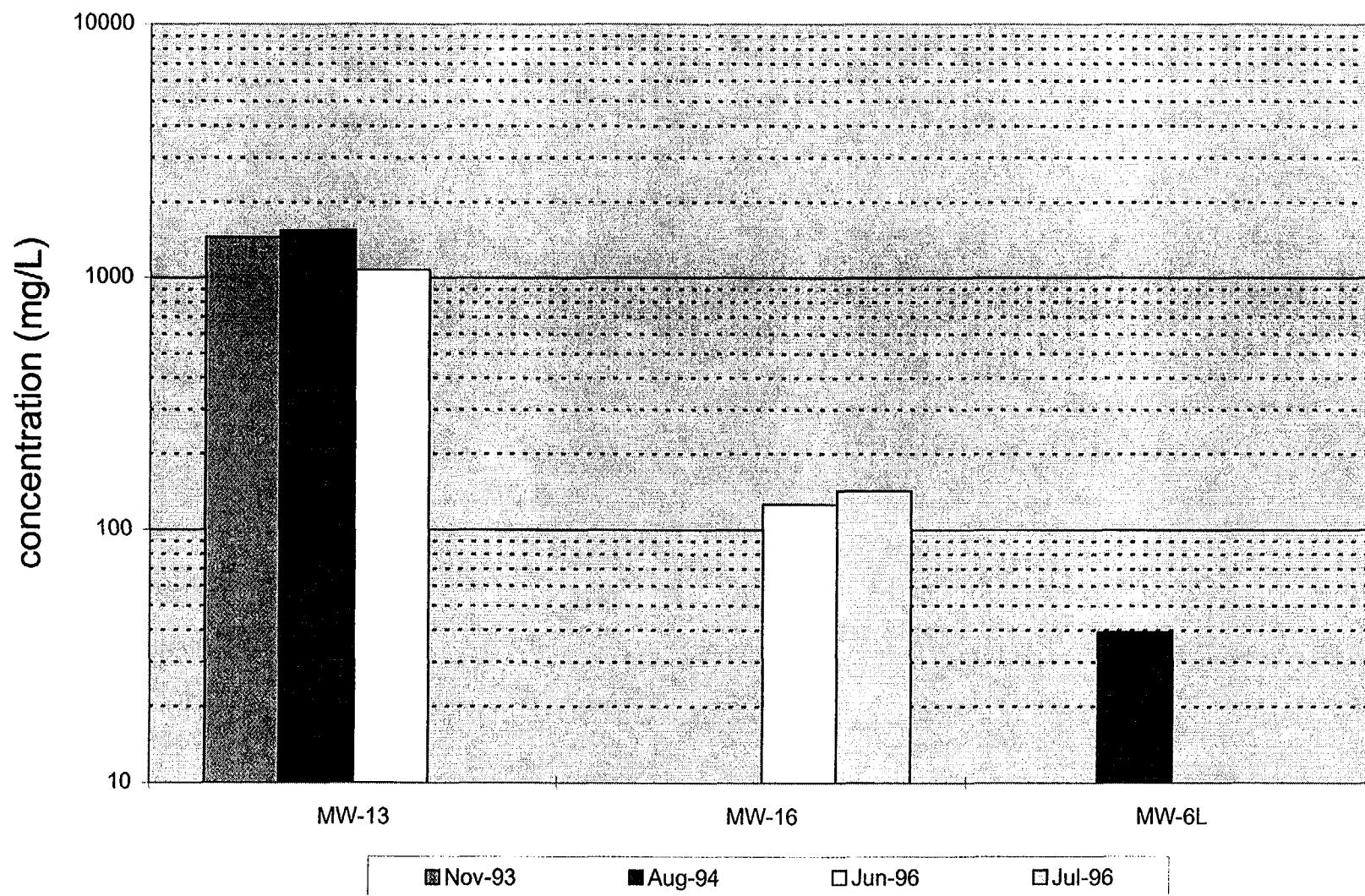


Figure 3-34b

Contaminated Bedrock Ground-water Monitoring Wells Total Recoverable Cadmium

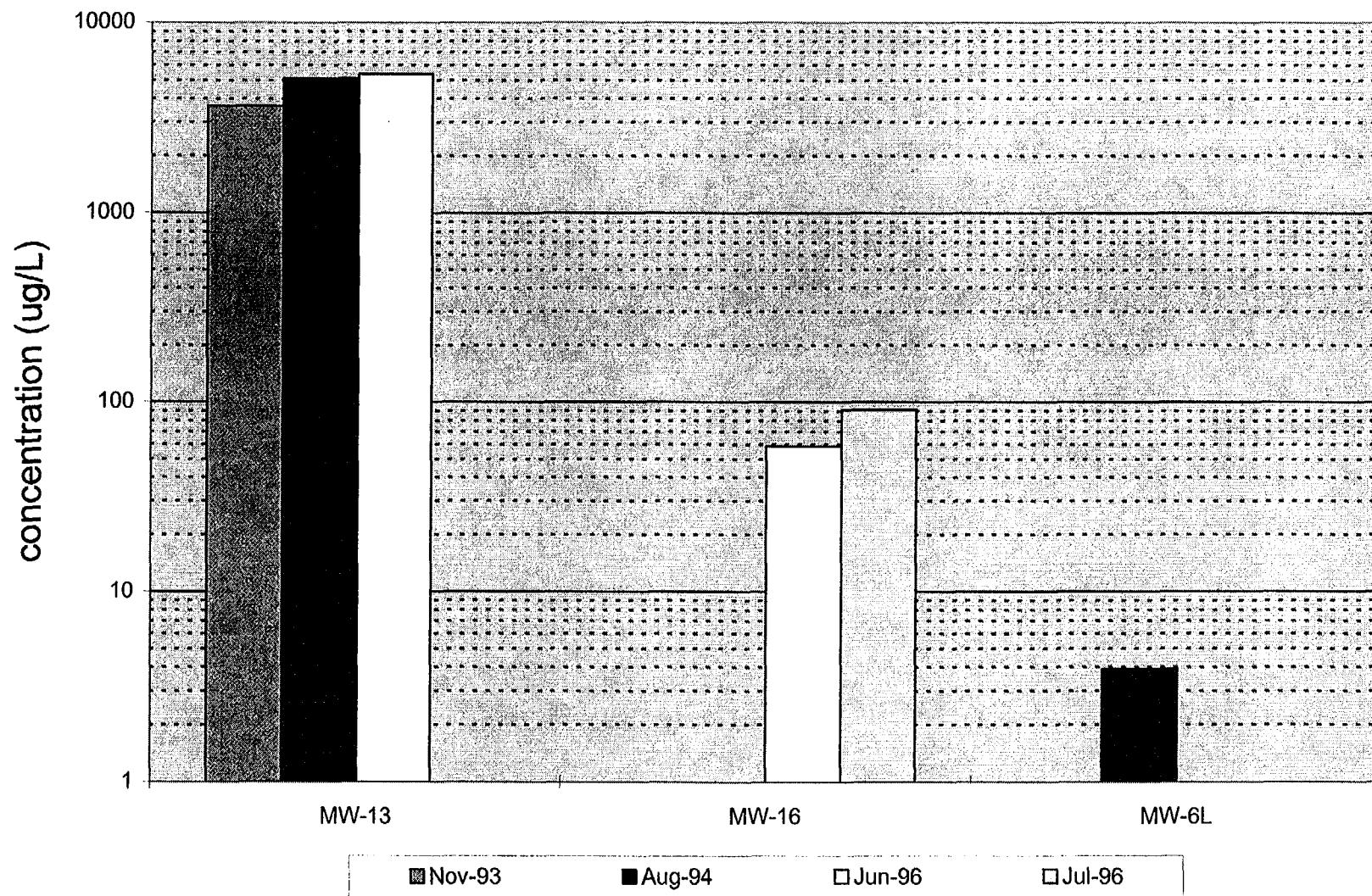


Figure 3-34c

Contaminated Bedrock Ground-water Monitoring Wells Total Recoverable Iron

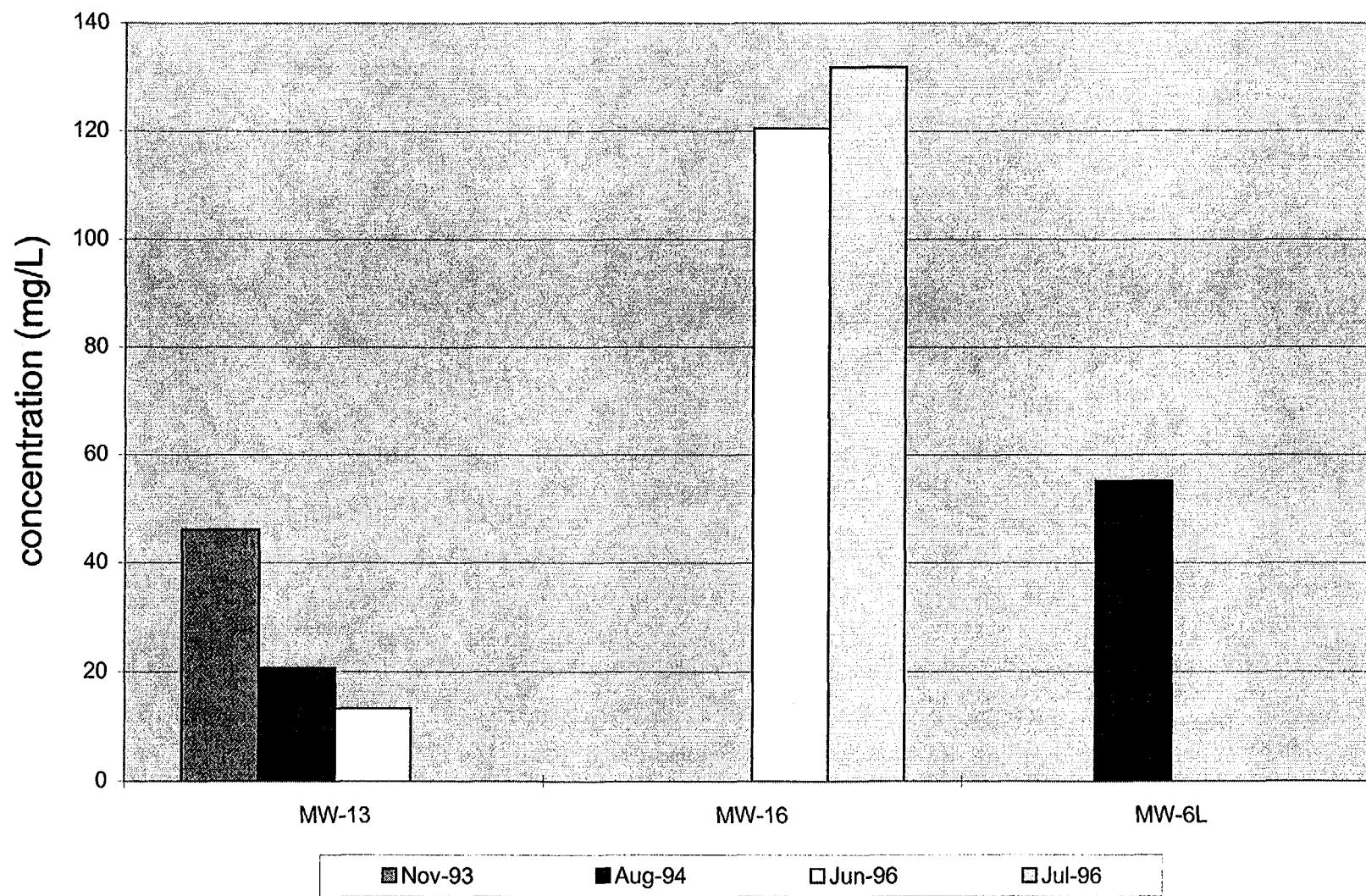


Figure 3-34d

Contaminated Bedrock Ground-water Monitoring Wells Total Recoverable Lead

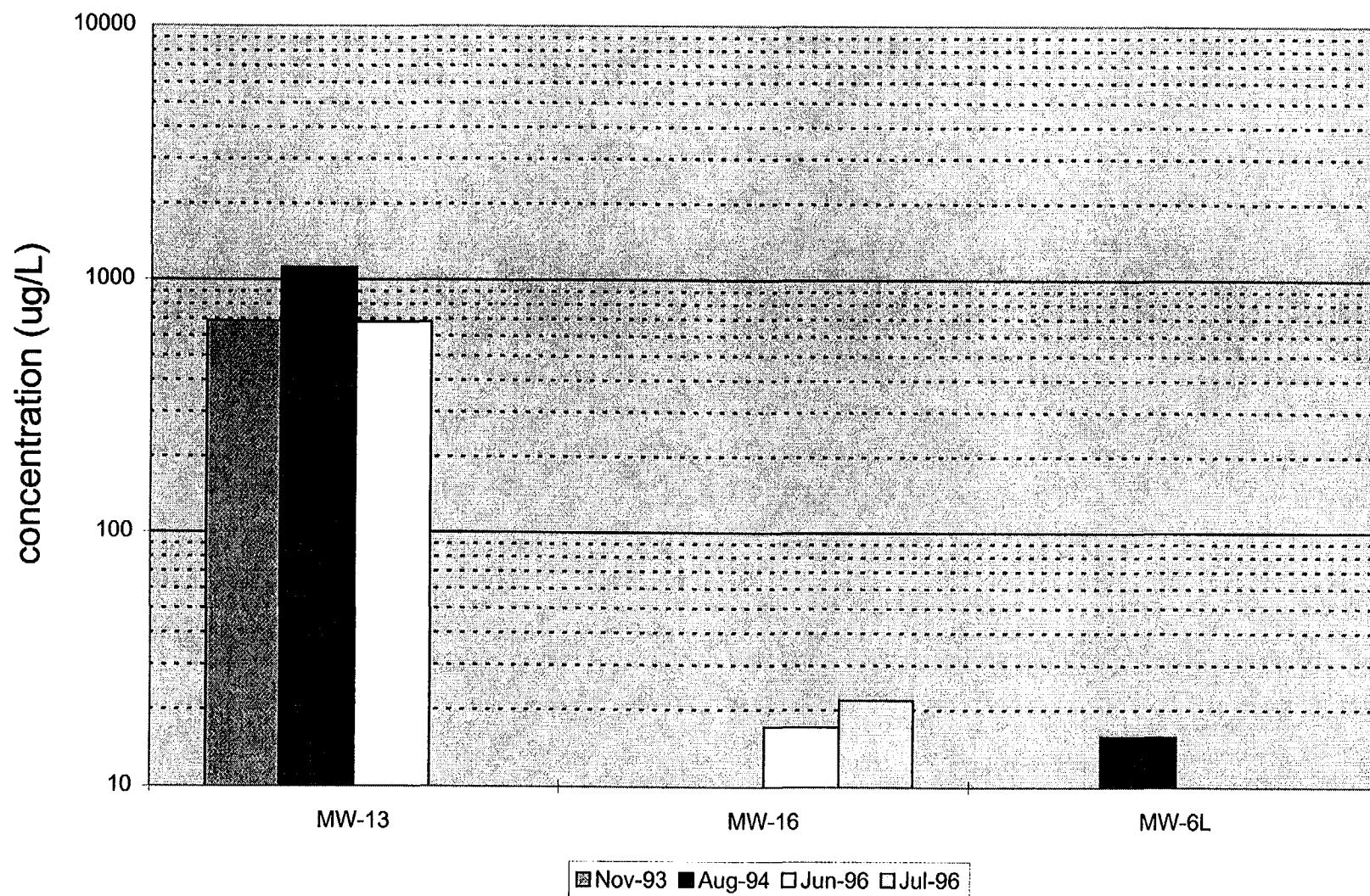


Figure 3-34e

Contaminated Bedrock Ground-water Monitoring Wells Total Recoverable Manganese

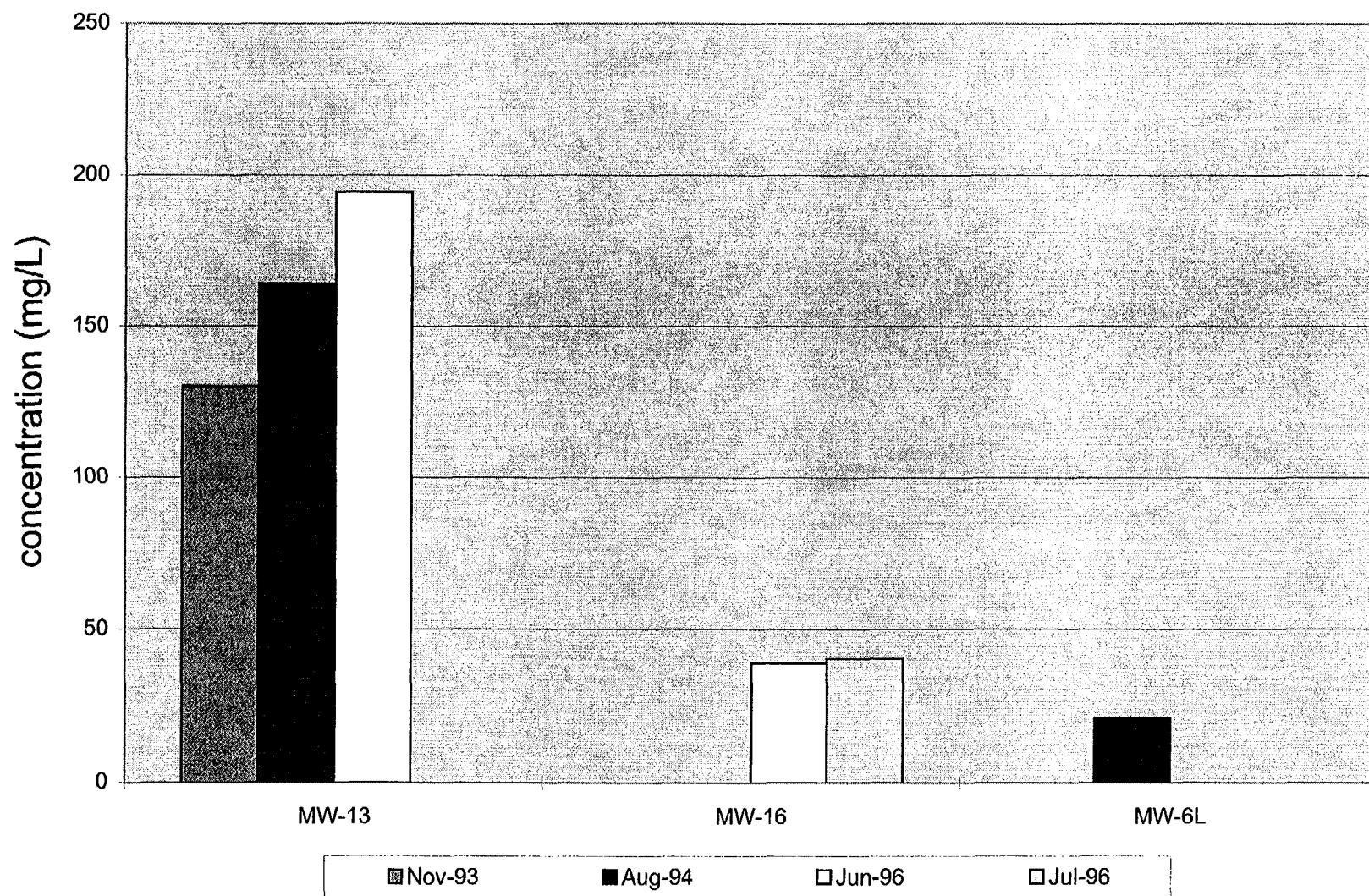


Figure 3-34f

Contaminated Bedrock Ground-water Monitoring Wells Sulfate

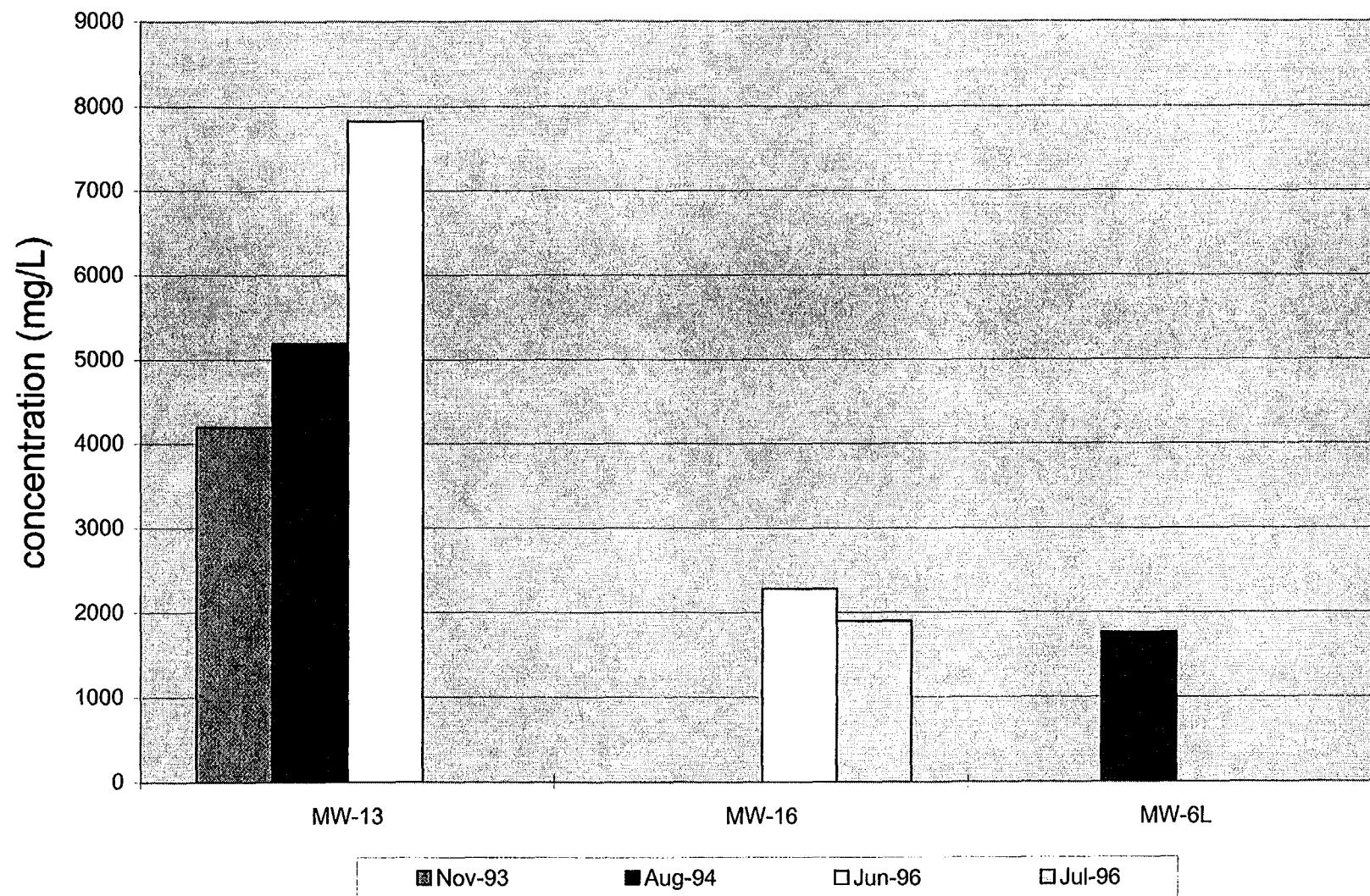


Figure 3-34g

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells pH

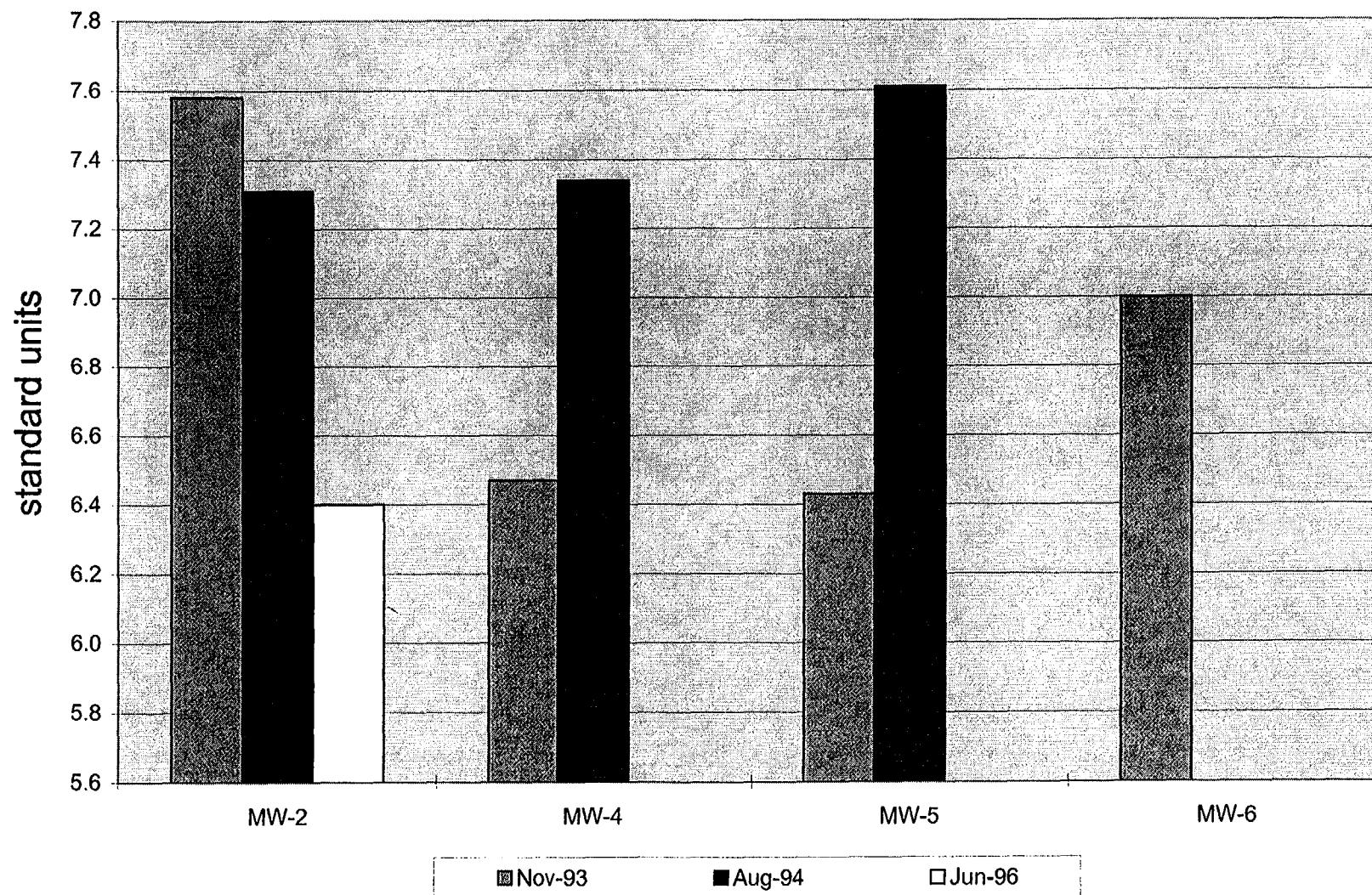


Figure 3-35a

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells
Total Recoverable Zinc

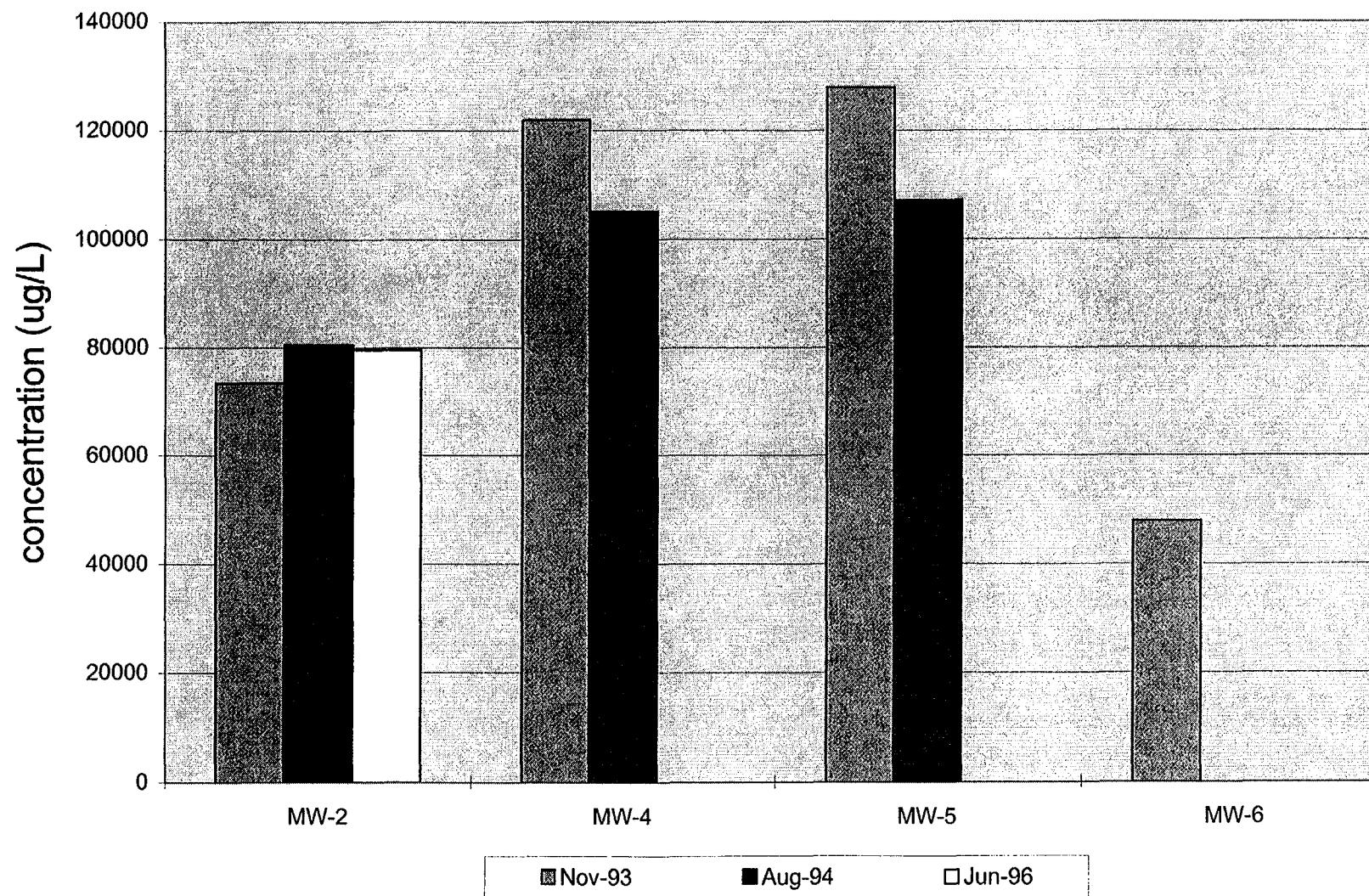


Figure 3-35b

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells
Total Recoverable Cadmium

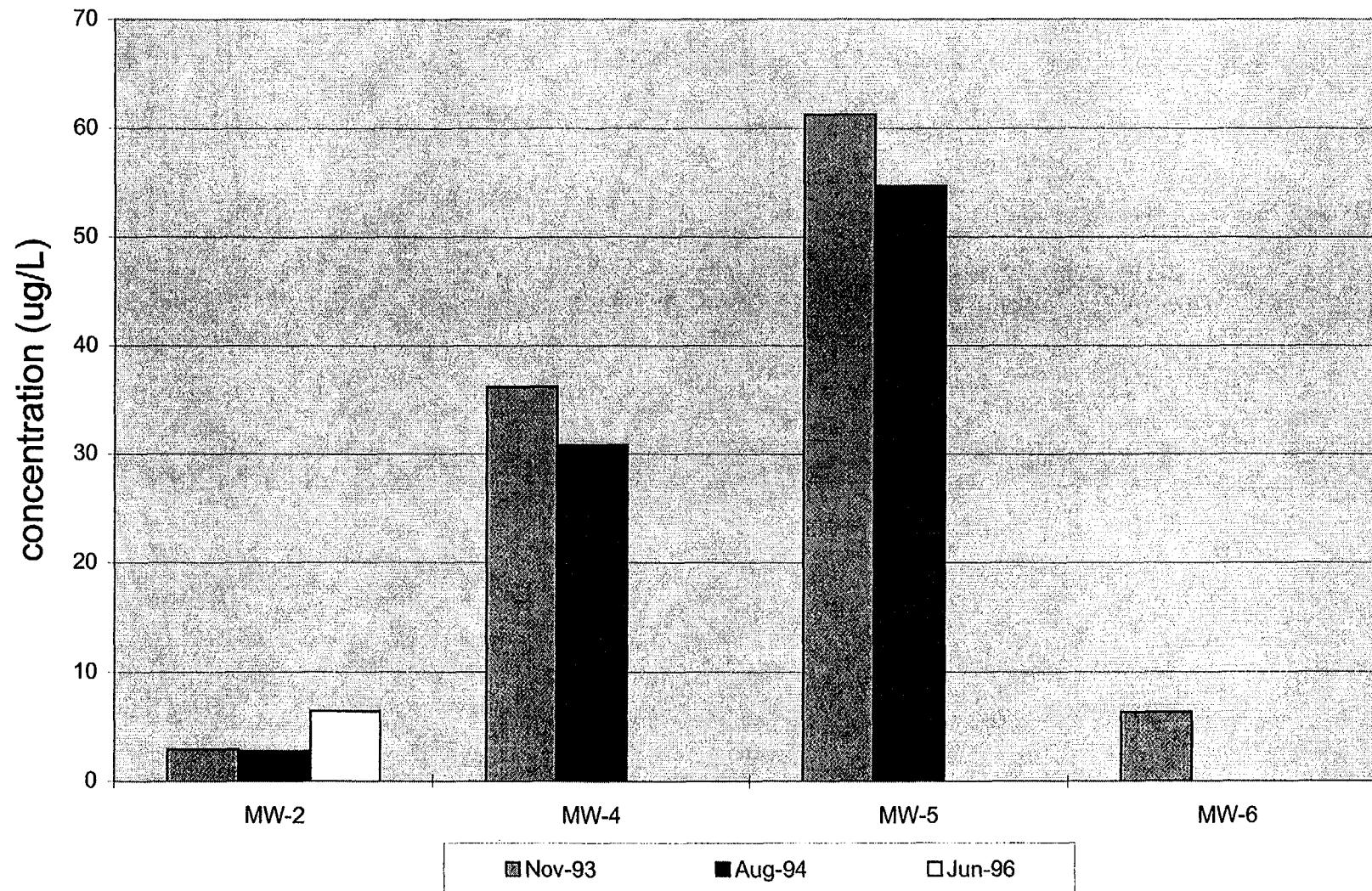


Figure 3-35c

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells
Total Recoverable Iron

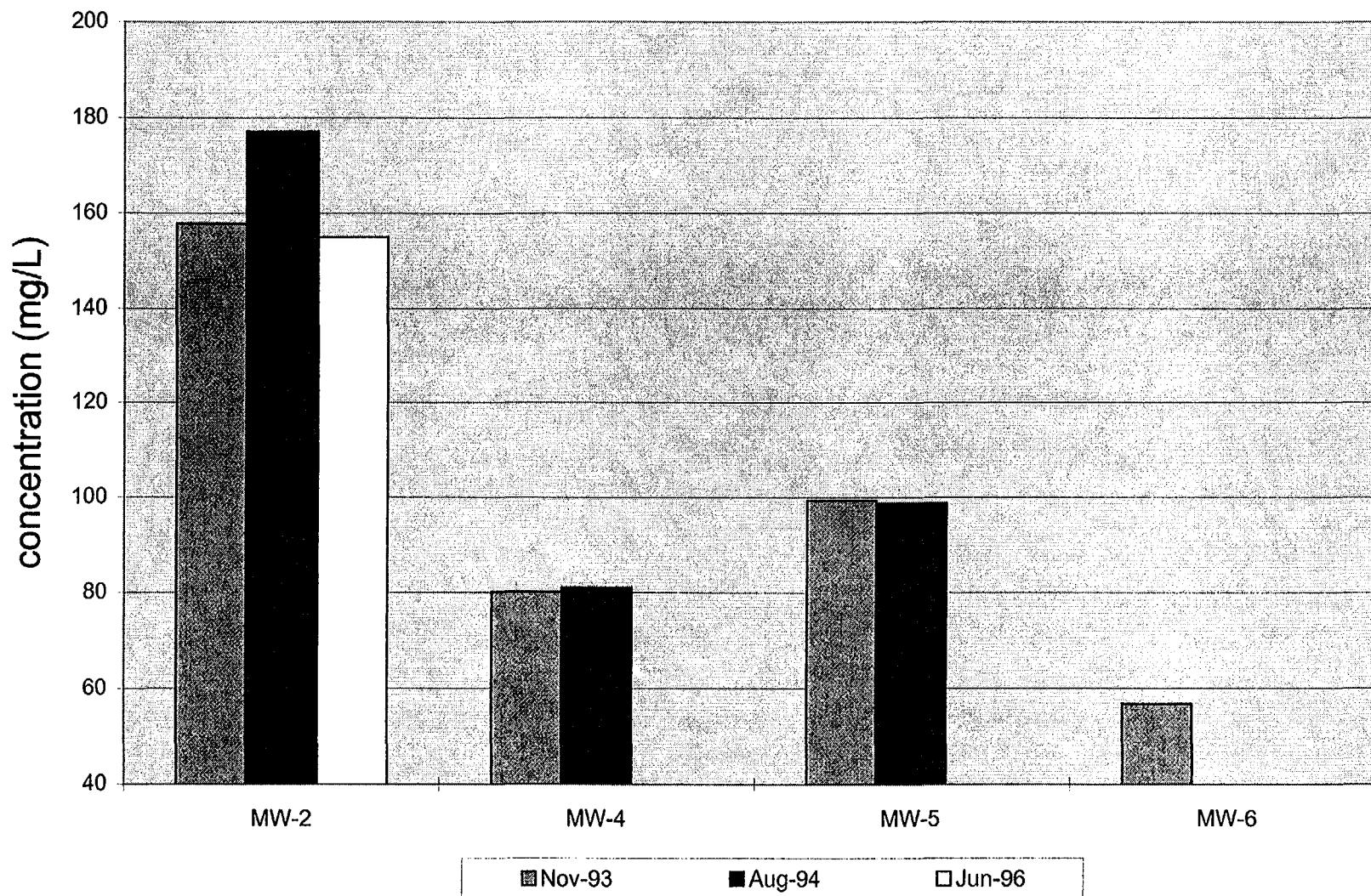


Figure 3-35d

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells Total Recoverable Lead

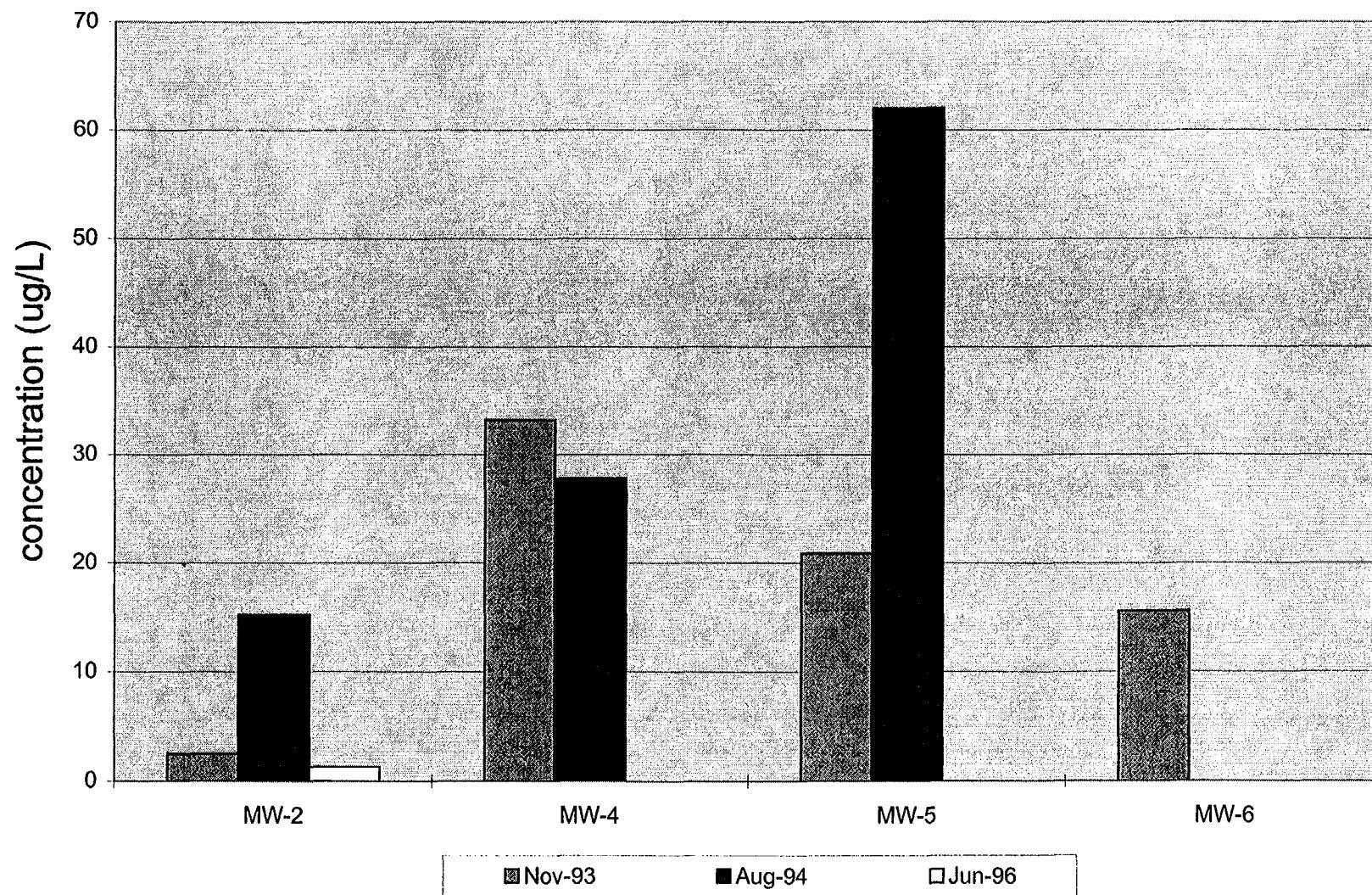


Figure 3-35e

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells Total Recoverable Manganese

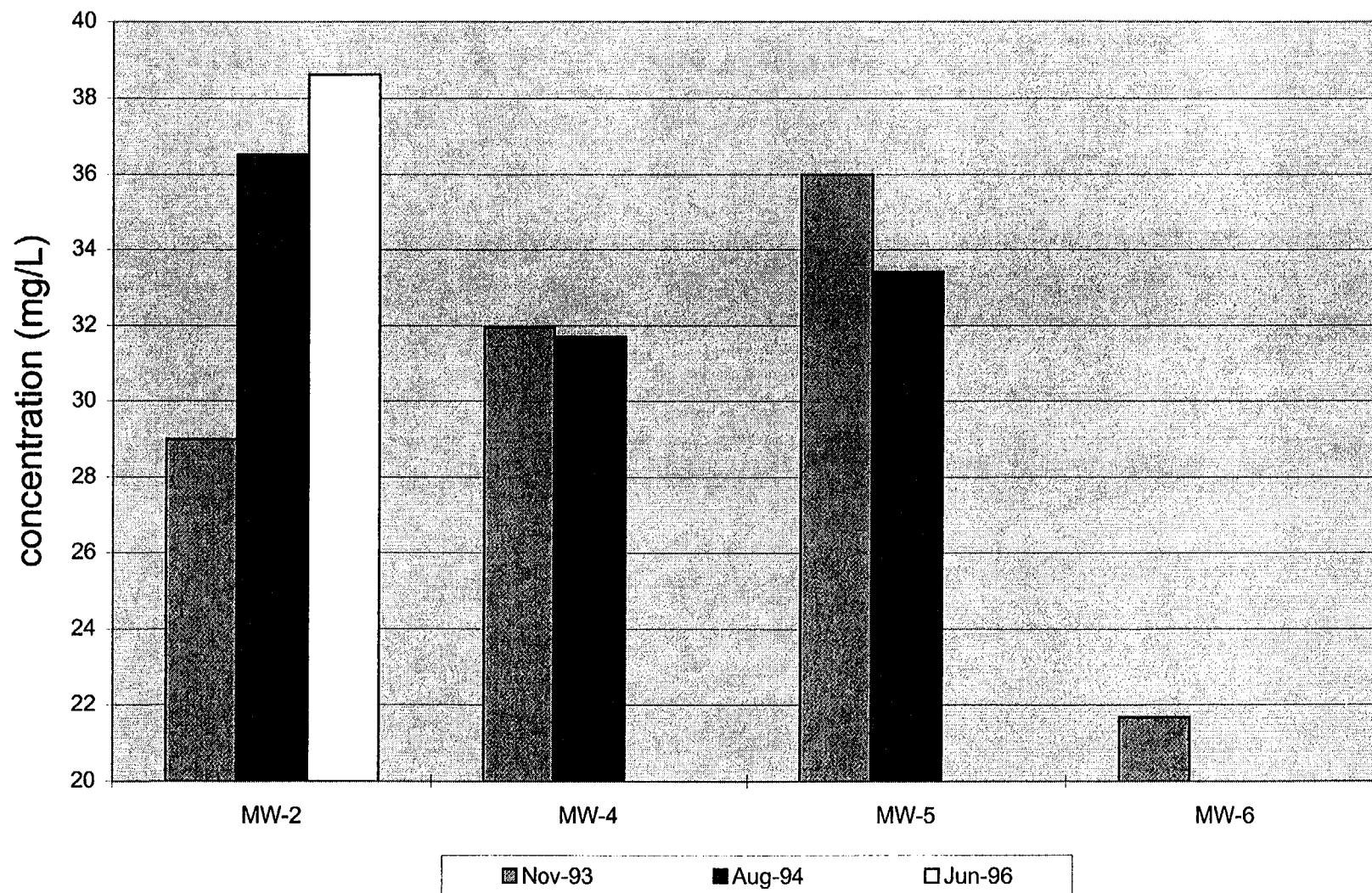


Figure 3-35f

Contaminated Alluvium/Bedrock Ground-water Monitoring Wells Sulfate

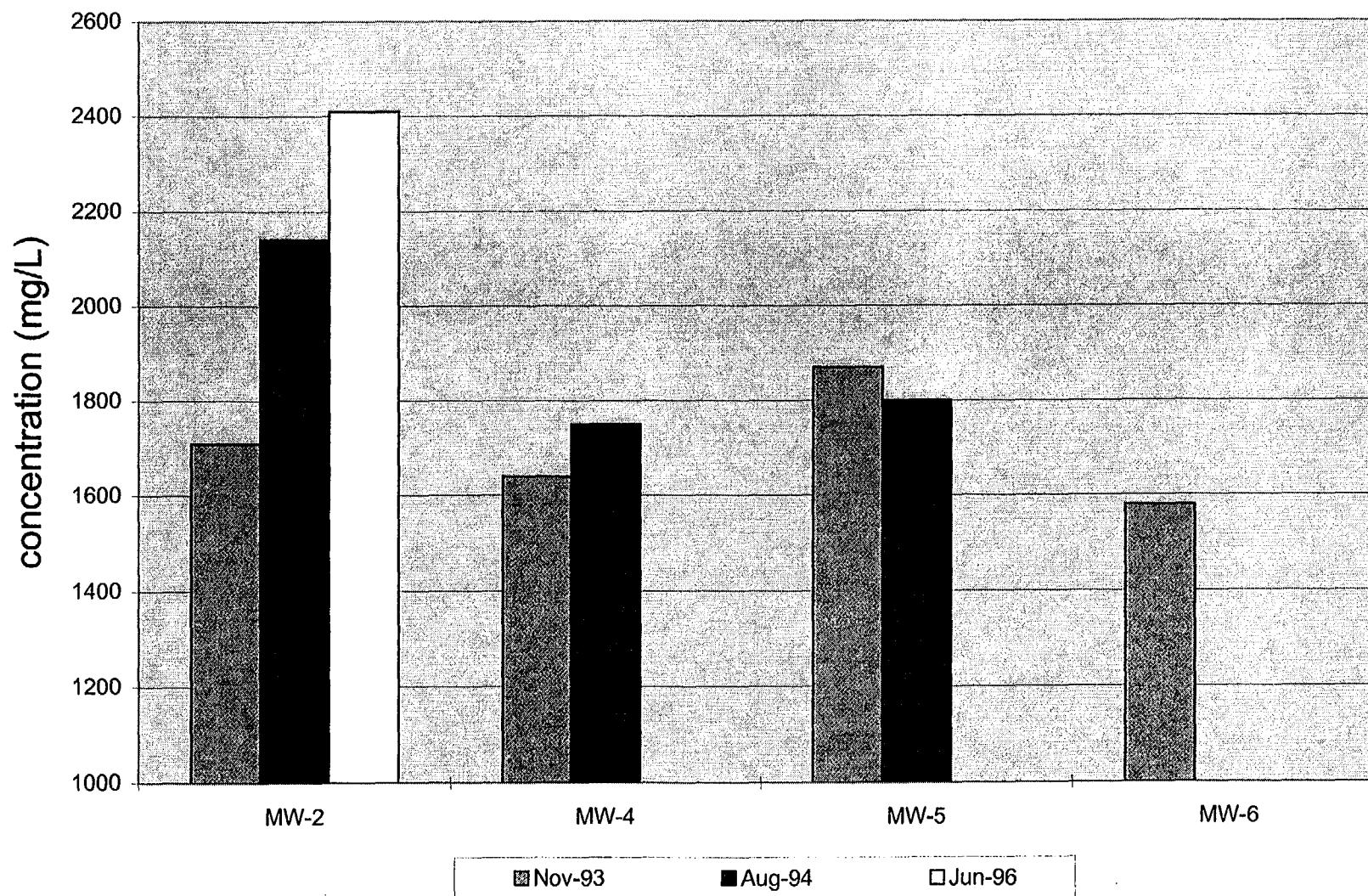


Figure 3-35g

Contaminated Ground-water Seeps & Roaster Fines pH

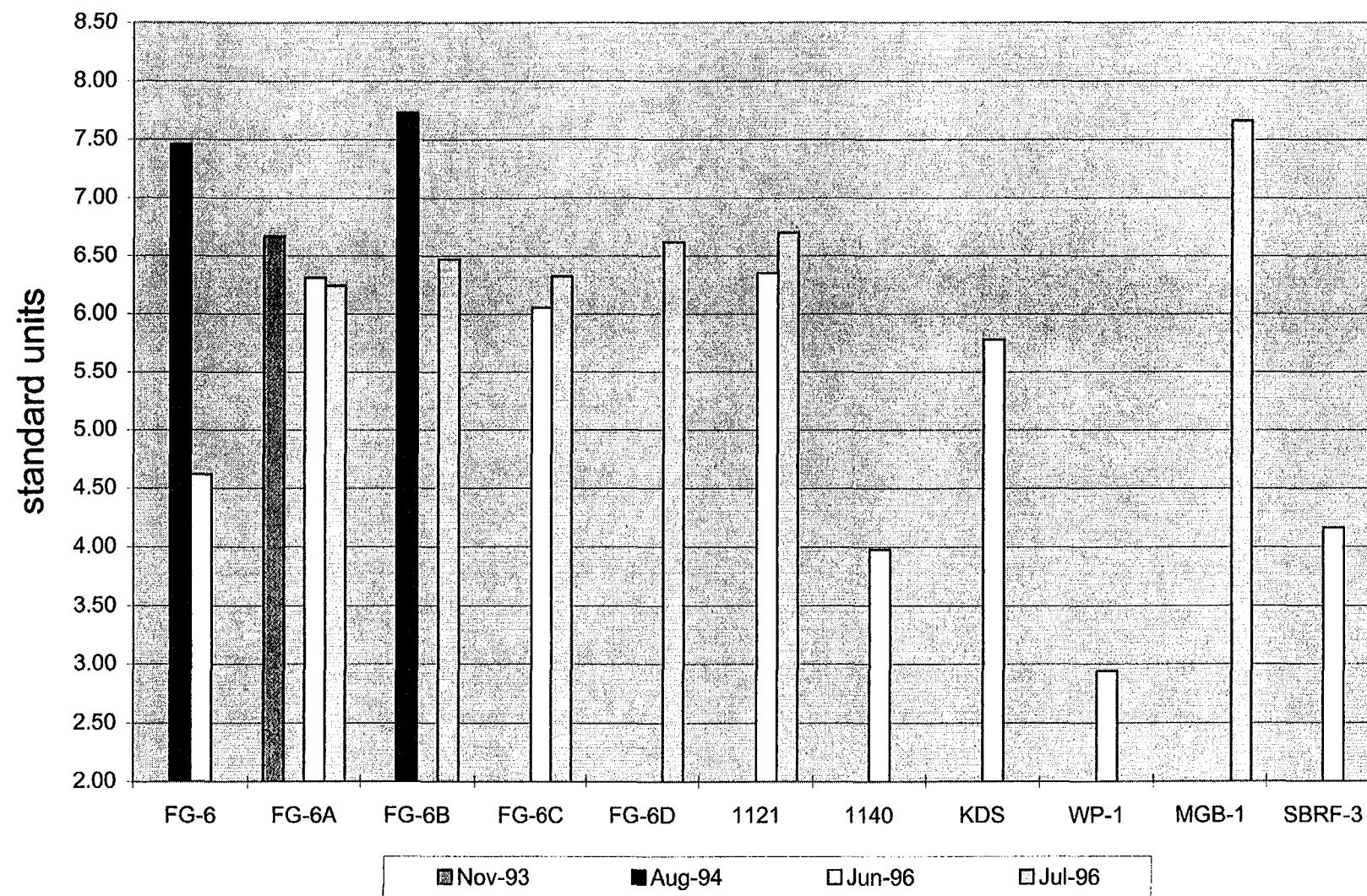


Figure 3-36a

Contaminated Ground-water Seeps & Roaster Fines Total Recoverable Zinc

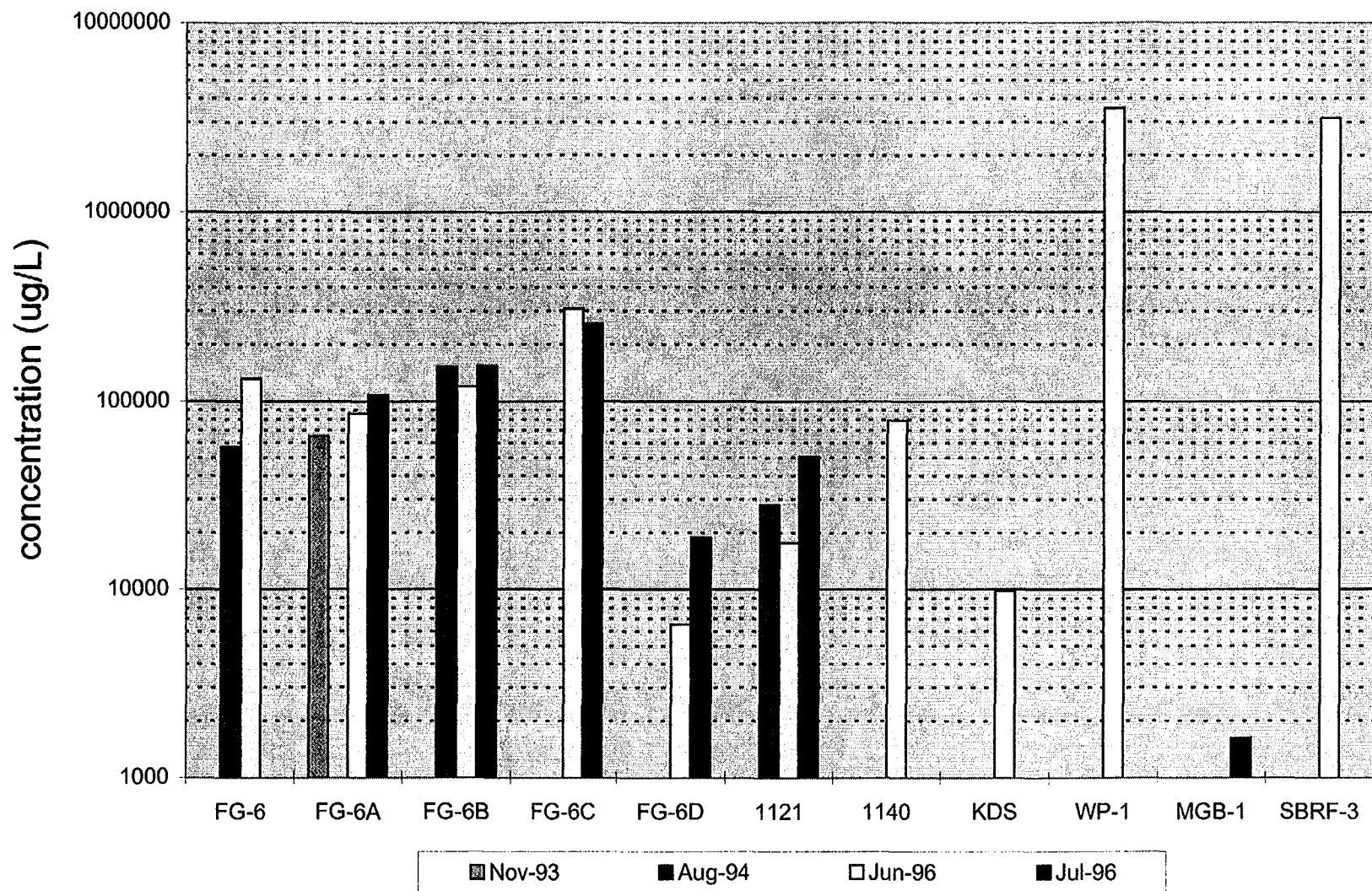


Figure 3-36b

Contaminated Ground-water Seeps & Roaster Fines Total Recoverable Cadmium

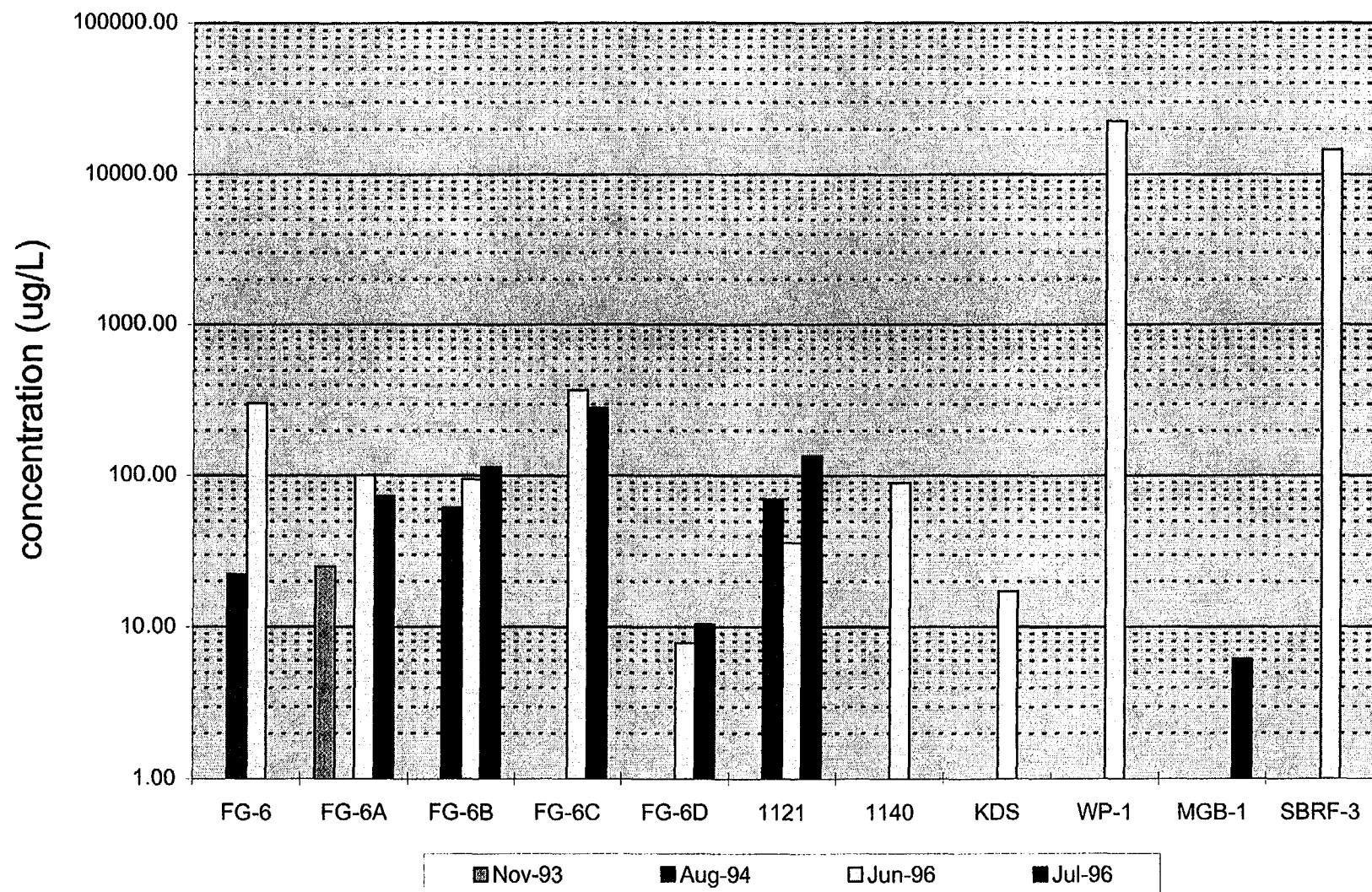


Figure 3-36c

Contaminated Ground-water Seeps & Roaster Fines Total Recoverable Iron

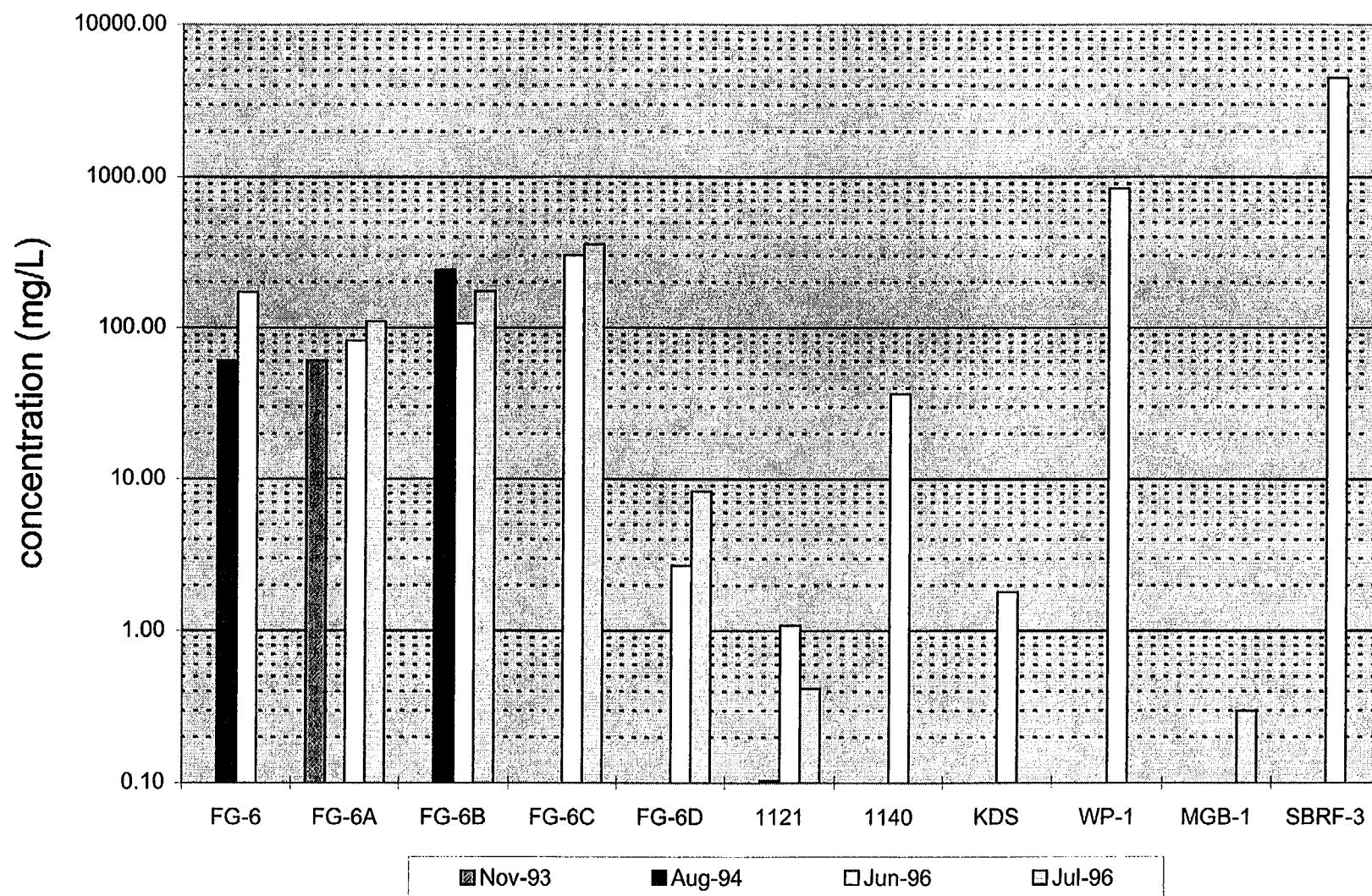


Figure 3-36d

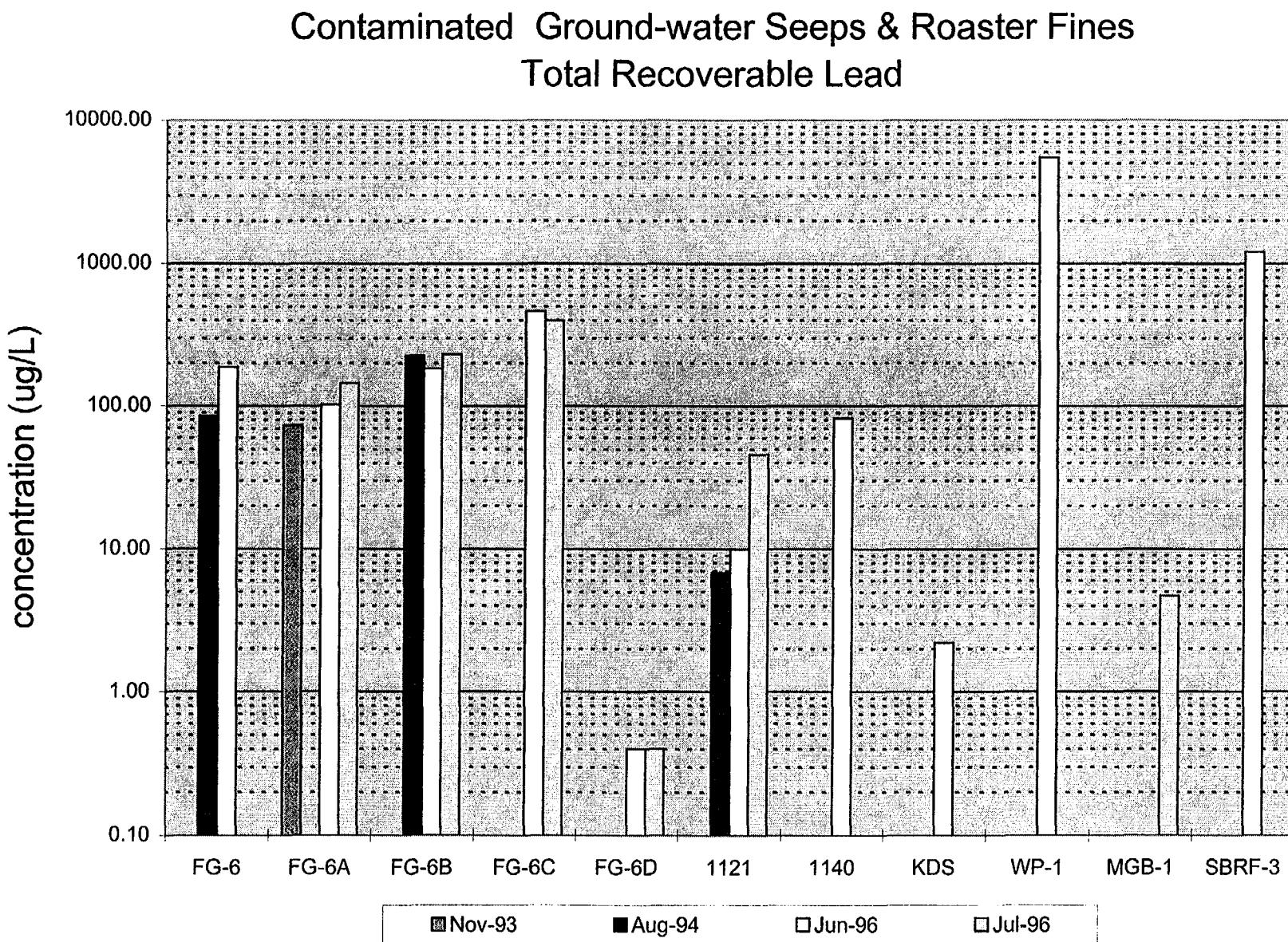


Figure 3-36e

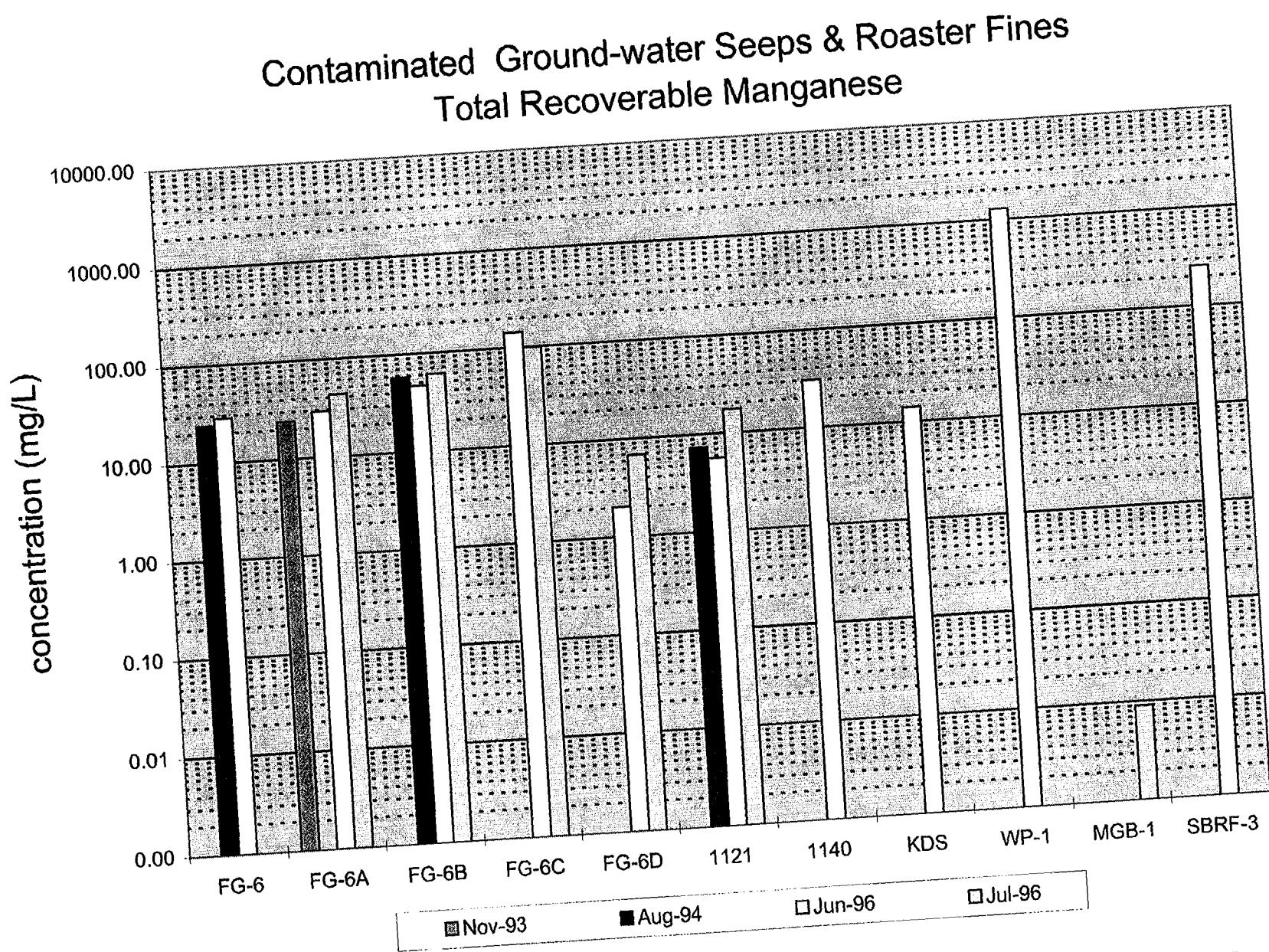


Figure 3-36f

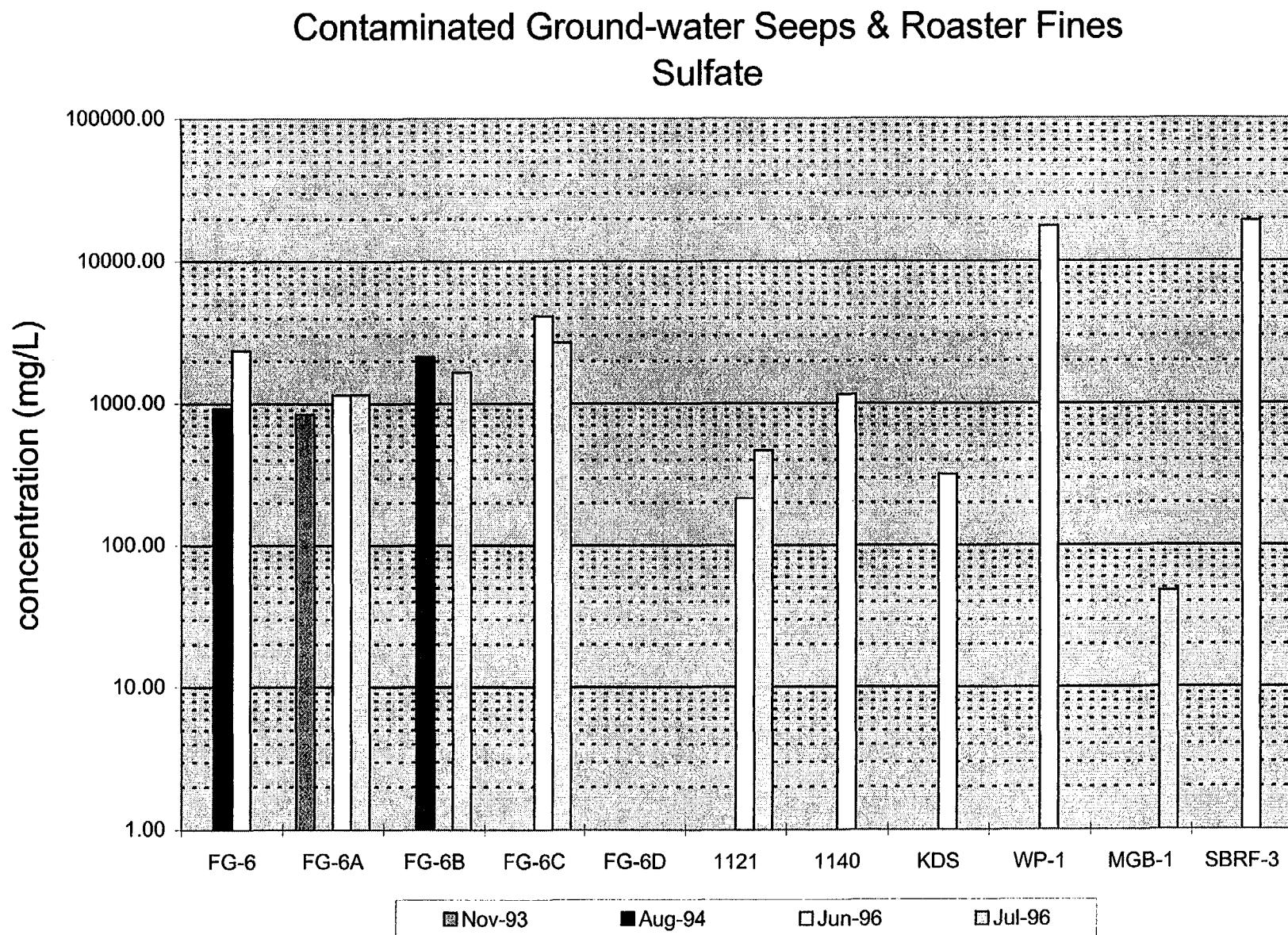
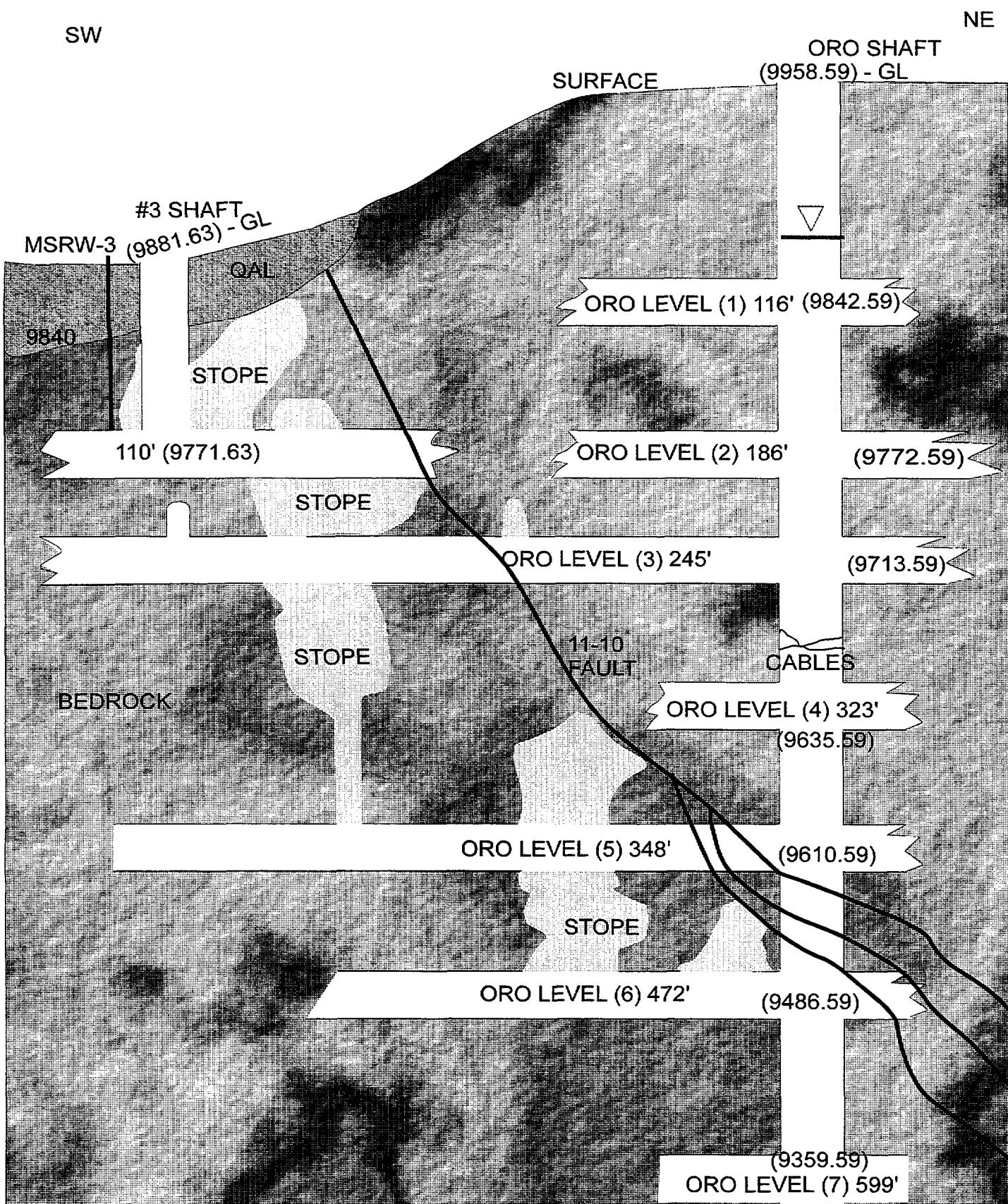


Figure 3-36g



SCHEMATIC DIAGRAM OF THE ORO AND #3 SHAFTS

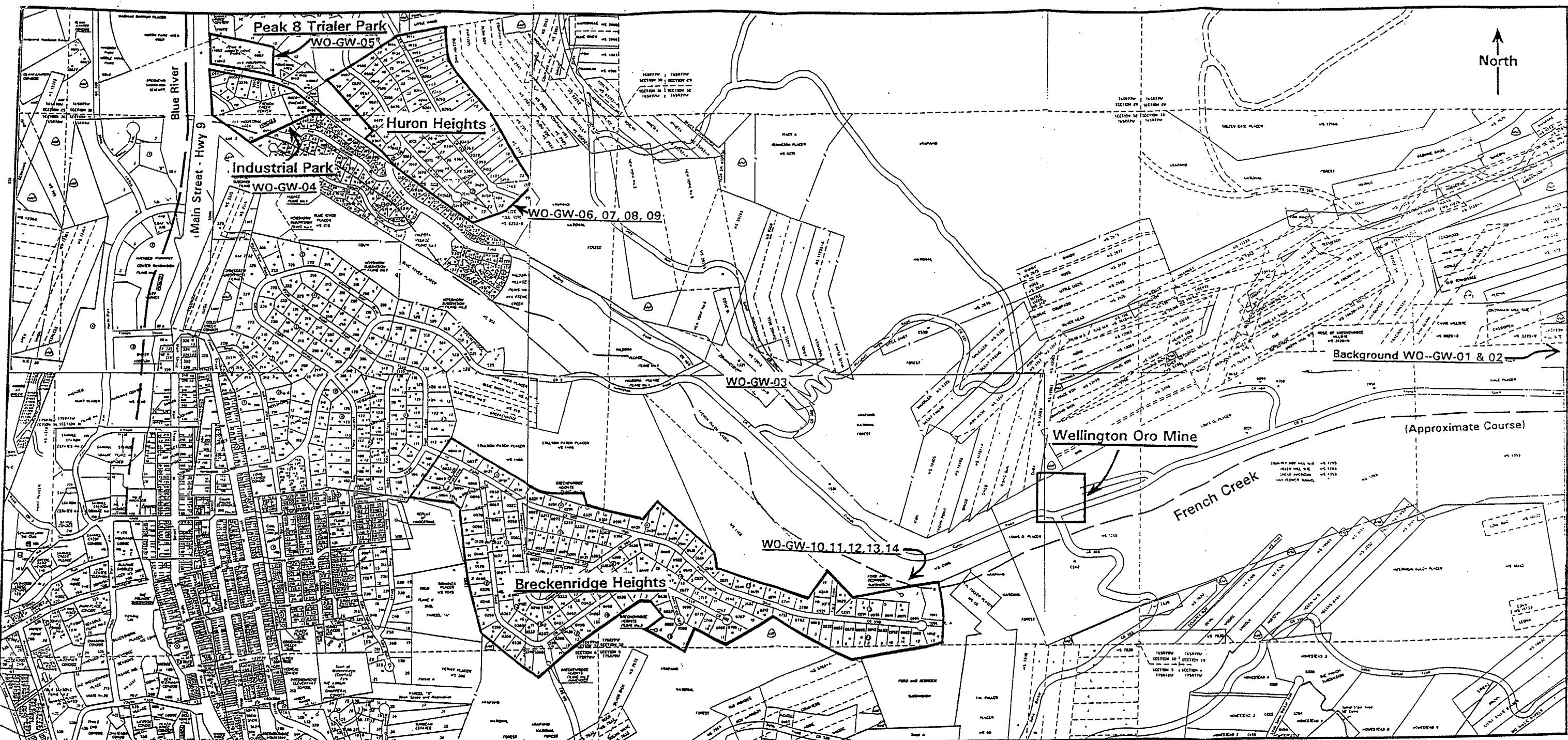
MINE LEVEL DEPTHS MEASURED FROM GROUND SURFACE

(elevation in feet above sea level)

DRAFTED BY AMERICAN GEOLOGICAL SERVICES, INC
AFTER LOVERING (1934)

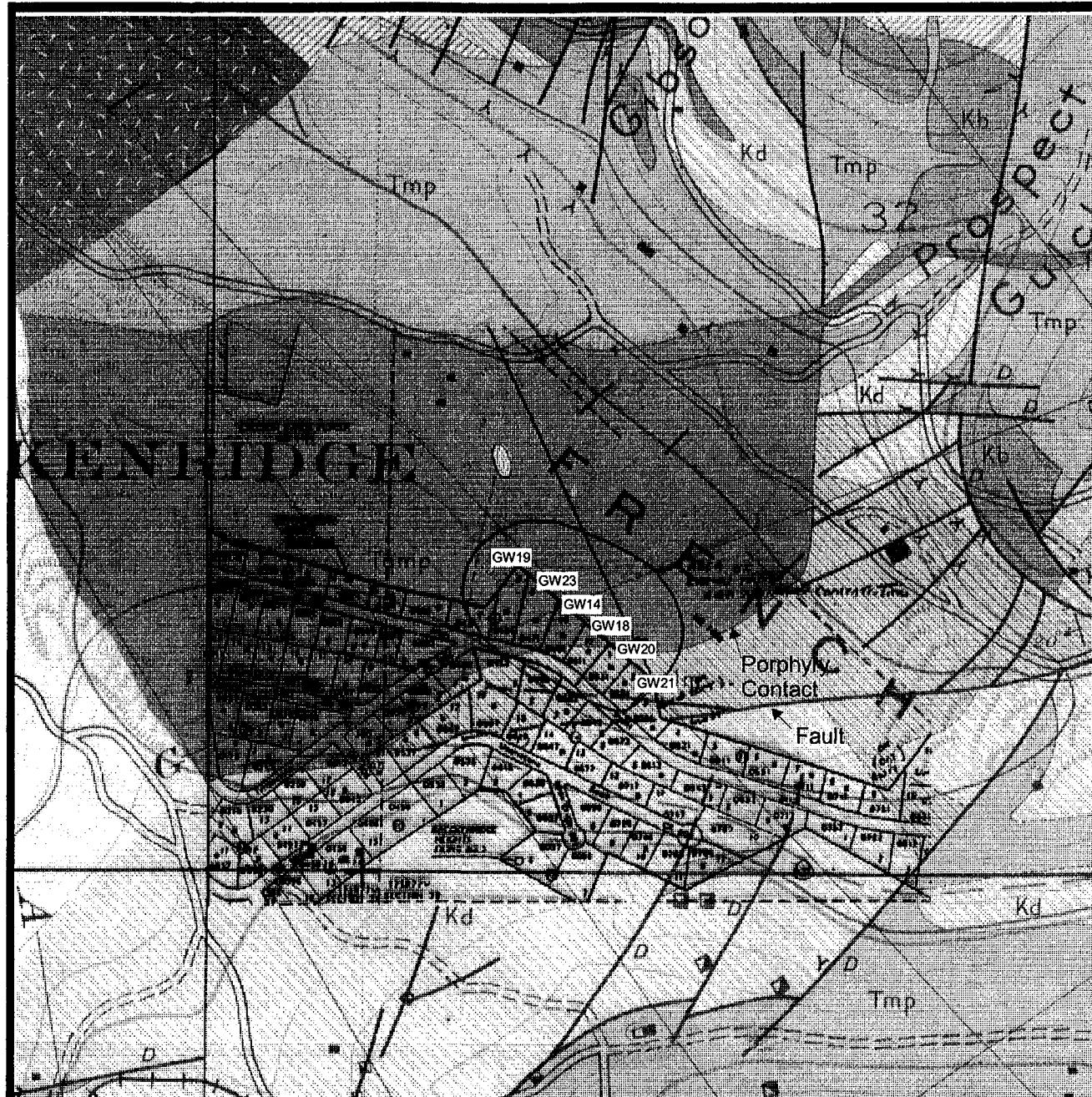
Figure 3-37

October 1996
 Domestic Ground-water Sample
 Location Map



Source: Summit County Rural Address Map Book

Figure 3-38



After Lovering, 1934

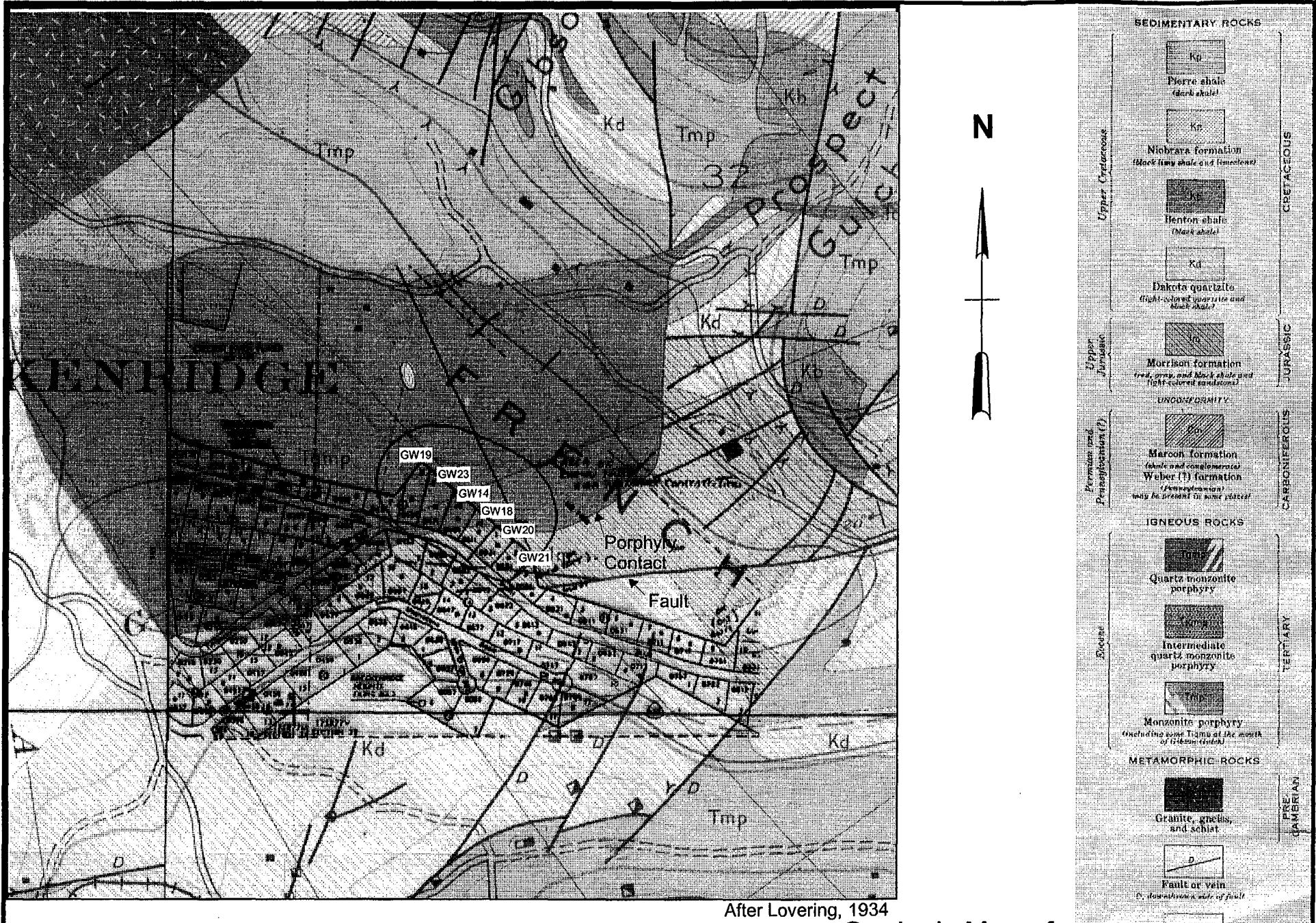
1/2 mile

0

Geologic Map of the Breckenridge Heights Area



Figure 3-39



Geologic Map of
the Breckenridge
Heights Area

Figure 3-39

SEDIMENTARY ROCKS	
Kd	Pierre shale (dark shale)
Kd	Niobrara formation (black clay shale and limestone)
Kd	Benton shale (black shale)
D	Dakota quartzite (light-colored quartzite and black shale)
D	Morrison formation (red, orange, and black shale and light-colored sandstone)
UNCONFORMITY	
D	Maroon formation (sandstone and conglomerate)
D	Weber (T1) formation (conglomerate)
D	(only bed present in lower part)
IGNEOUS ROCKS	
D	Quartz monzonite porphyry
D	Intermediate quartz monzonite porphyry
D	Monzonite porphyry (including some Tiama or Igneous rocks)
METAMORPHIC ROCKS	
D	Granite, gneiss, and schist
D	Fault or vein
D	(dip direction & angle of fault)
PRE-CAMBRIAN	
D	Strike and dip of rocks

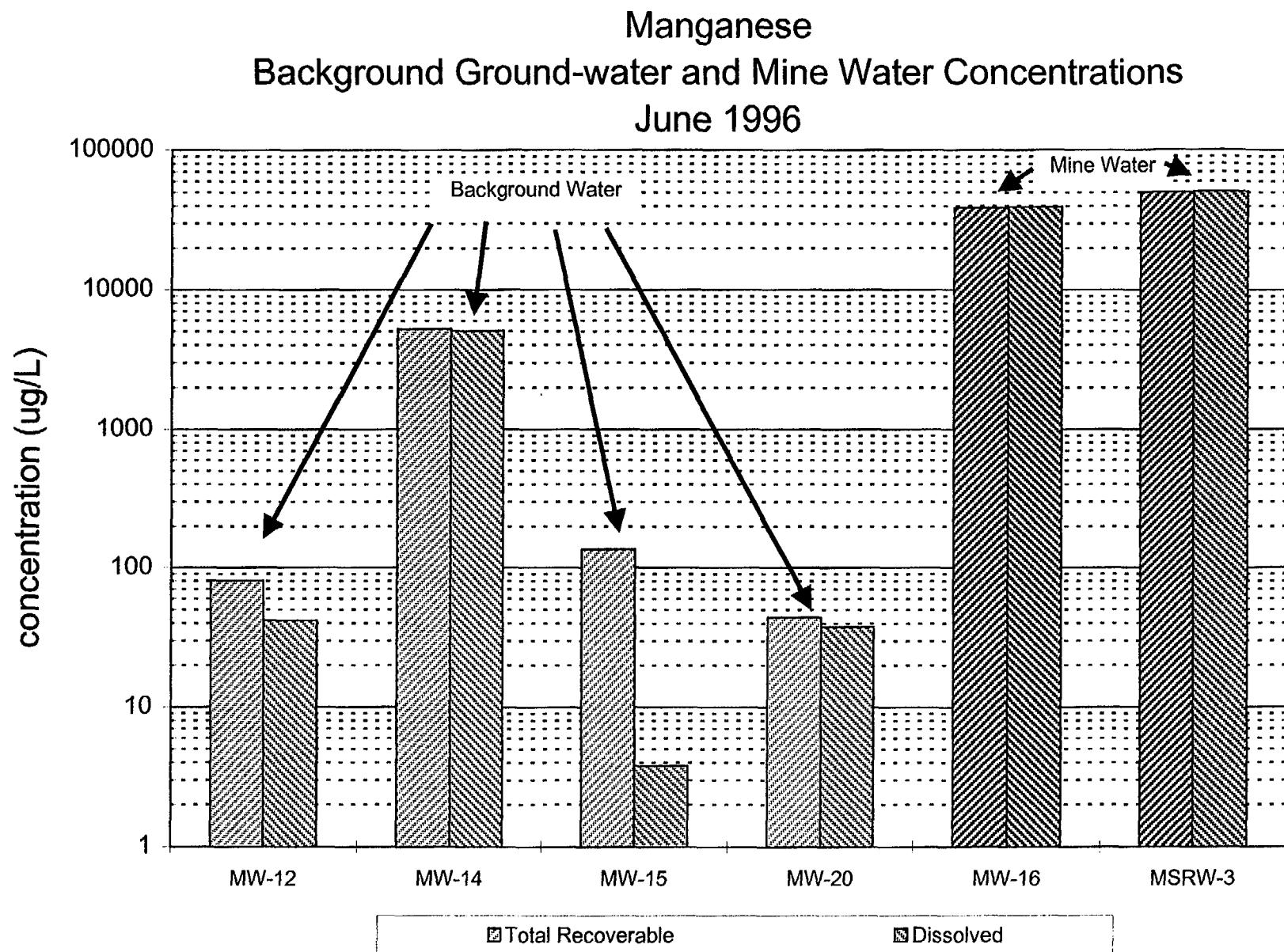


Figure 3-40

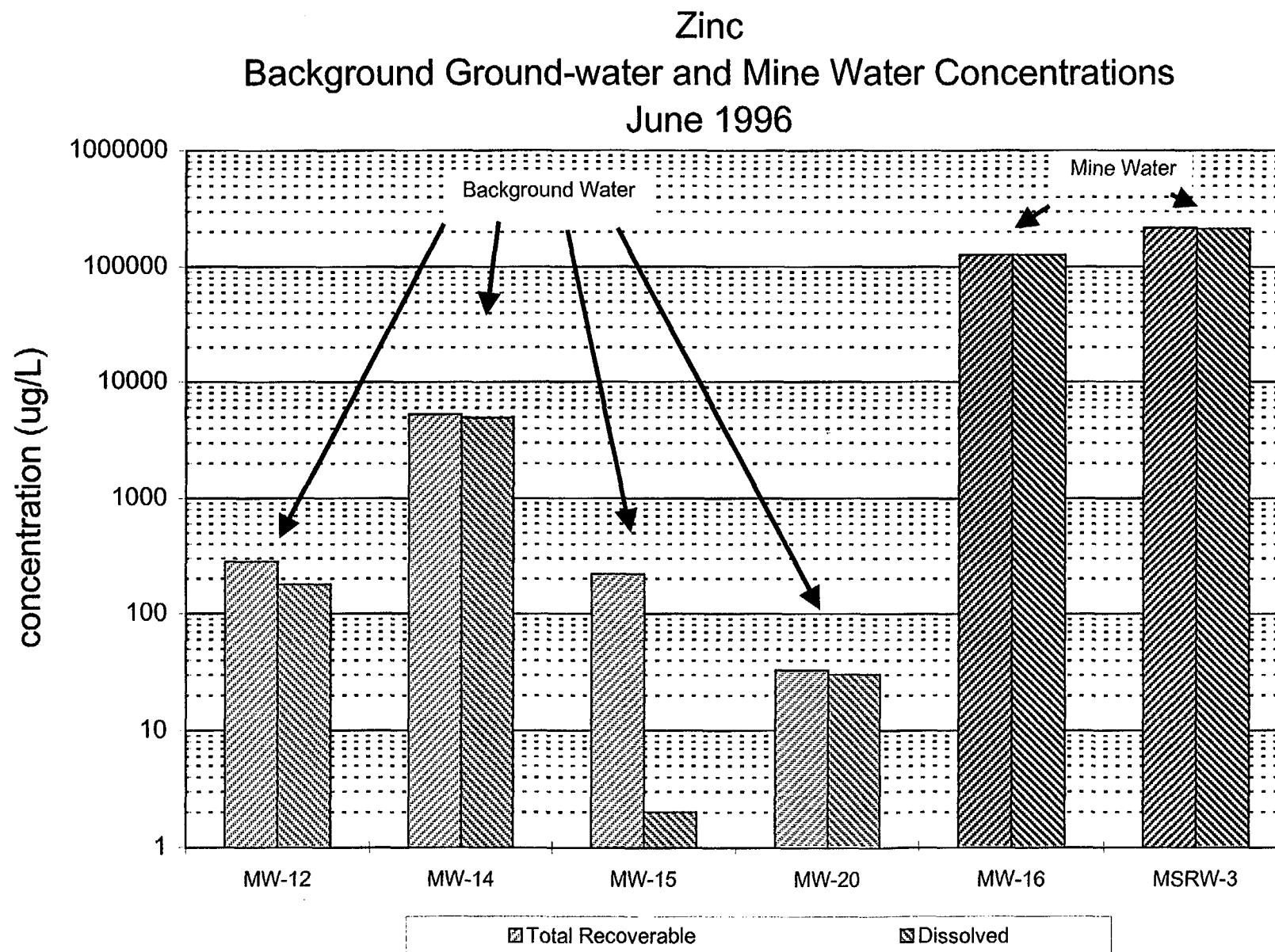


Figure 3-41

Comparison French Creek Stream Data (5/89)
w/Breckenridge Heights (4/97)

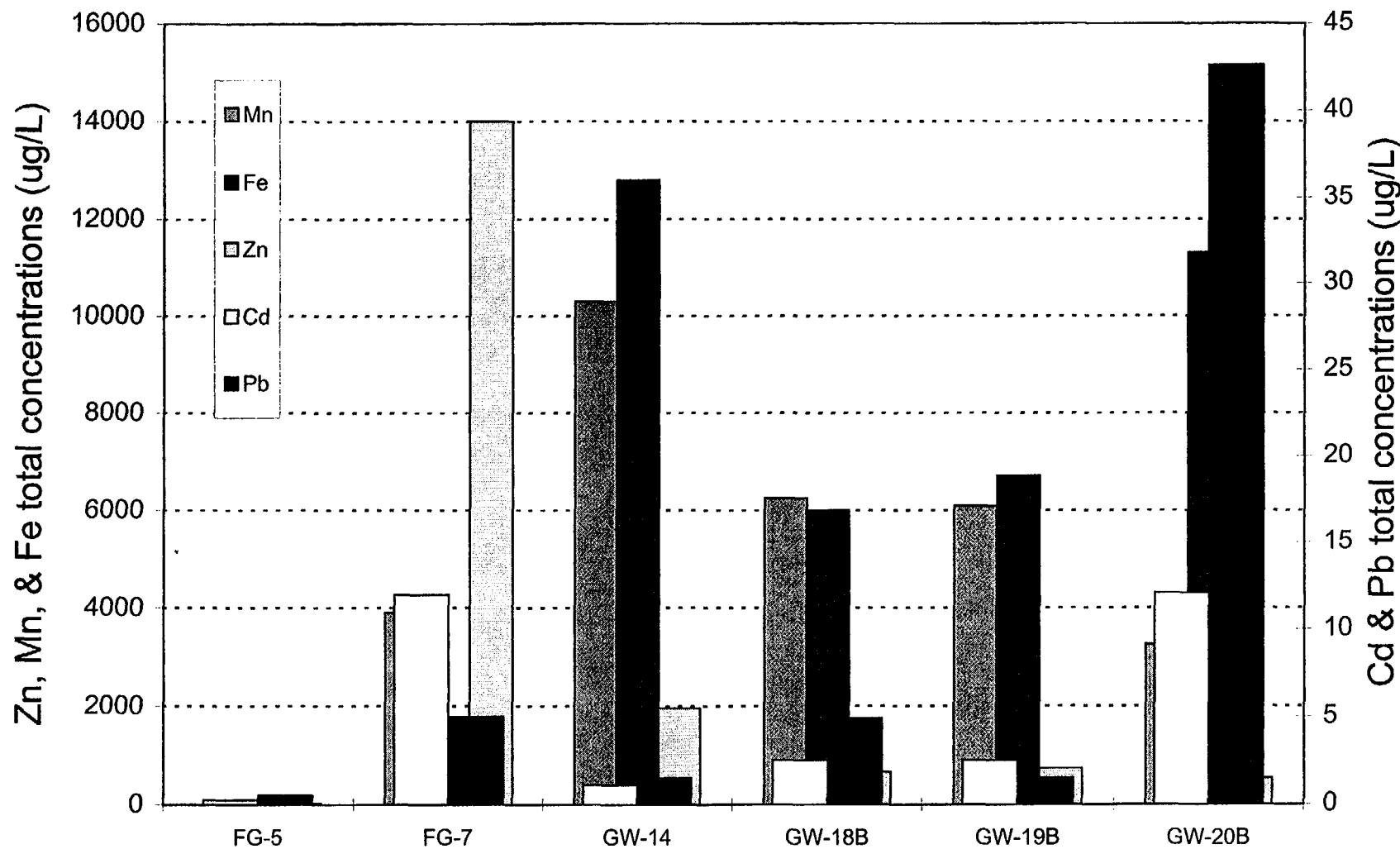


Figure 3-42

Comparison Calcium Concentrations of Mine Water w/Breckenridge Heights

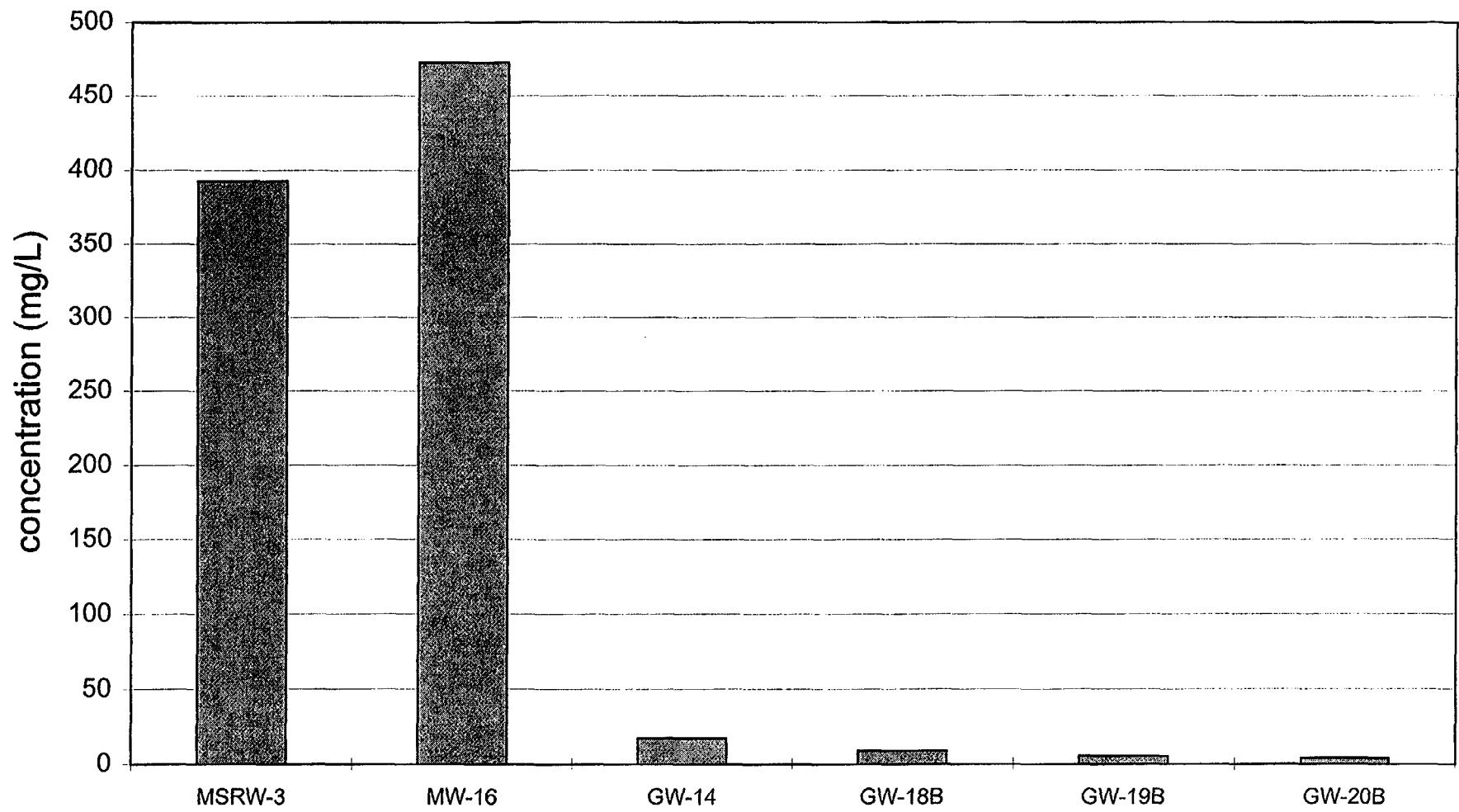


Figure 3-43

French Creek Hydrograph and Dillon Climatic Data Spring/Summer 1996

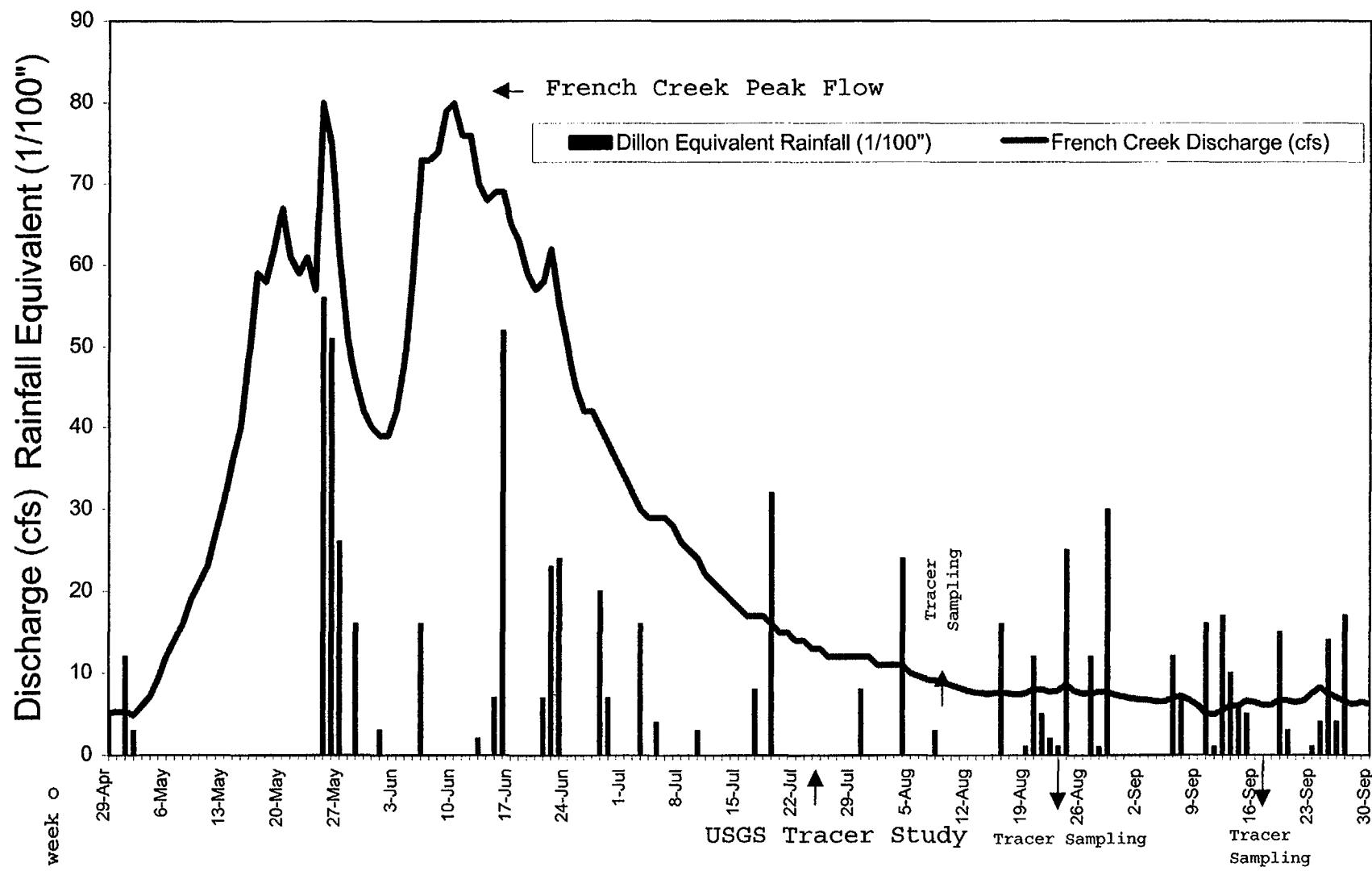
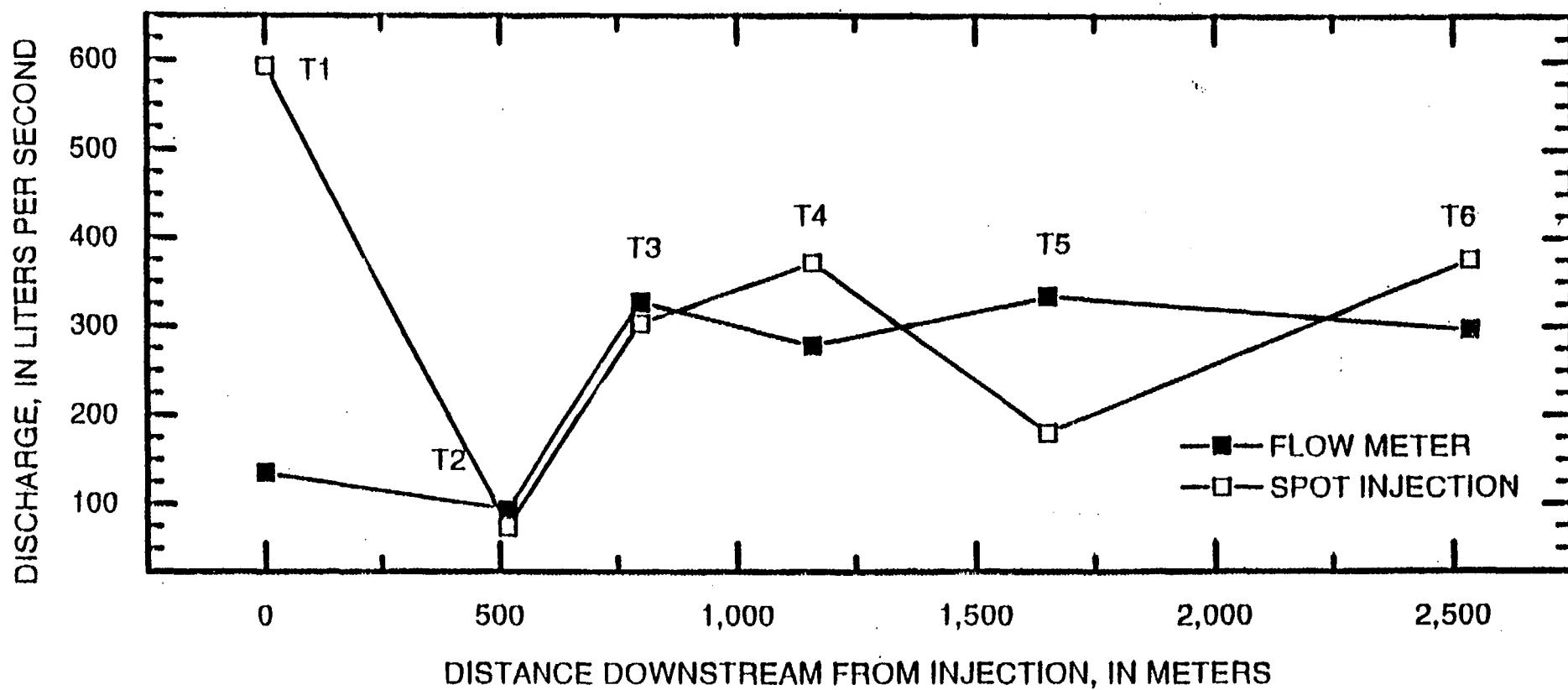


Figure 4-1

Comparison of Discharge Measured by Spot Injections of Tracer with Discharge Measured by Flow Meter



From Kimball et. al., 1997

Figure 4-2

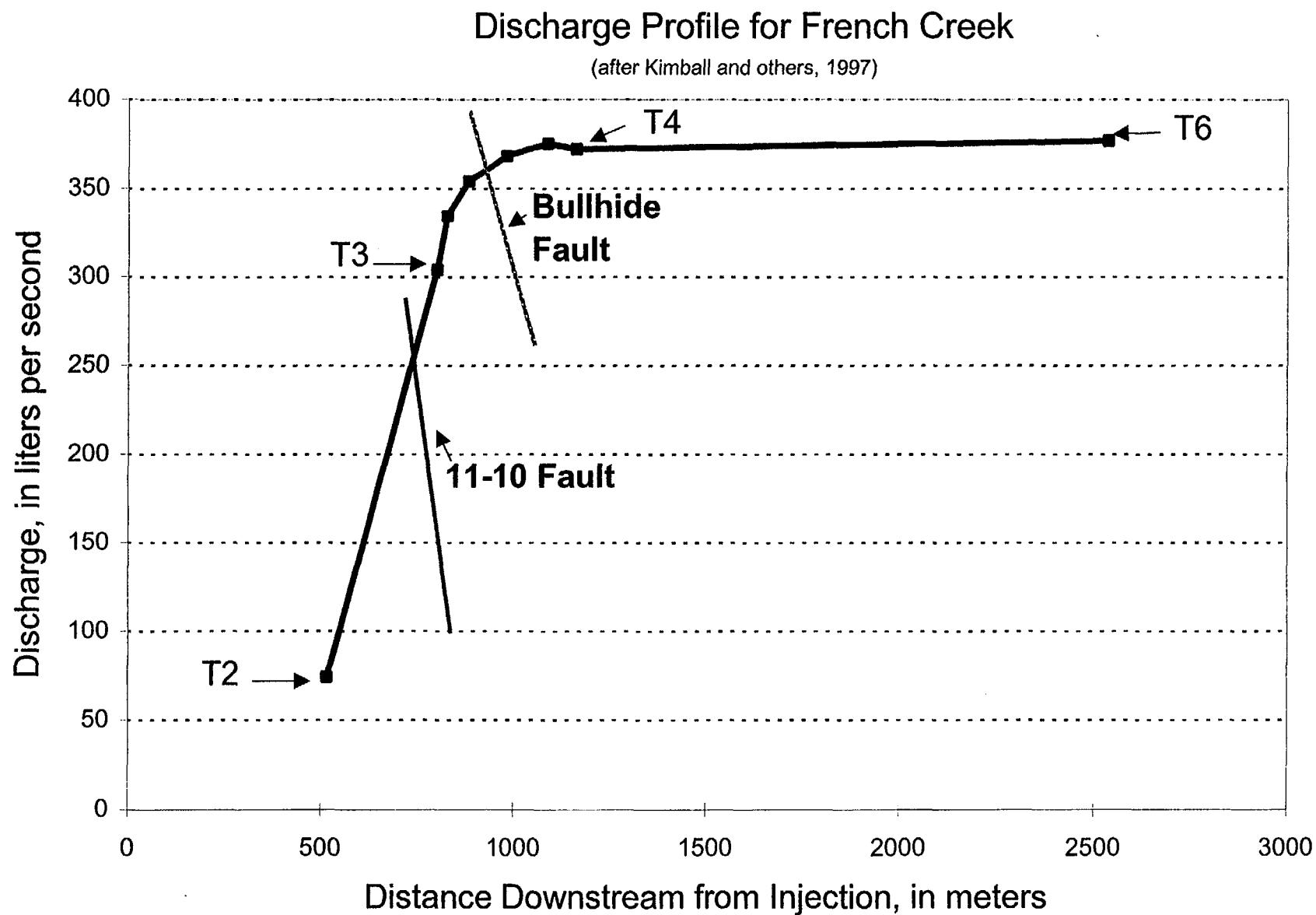


Figure 4-3

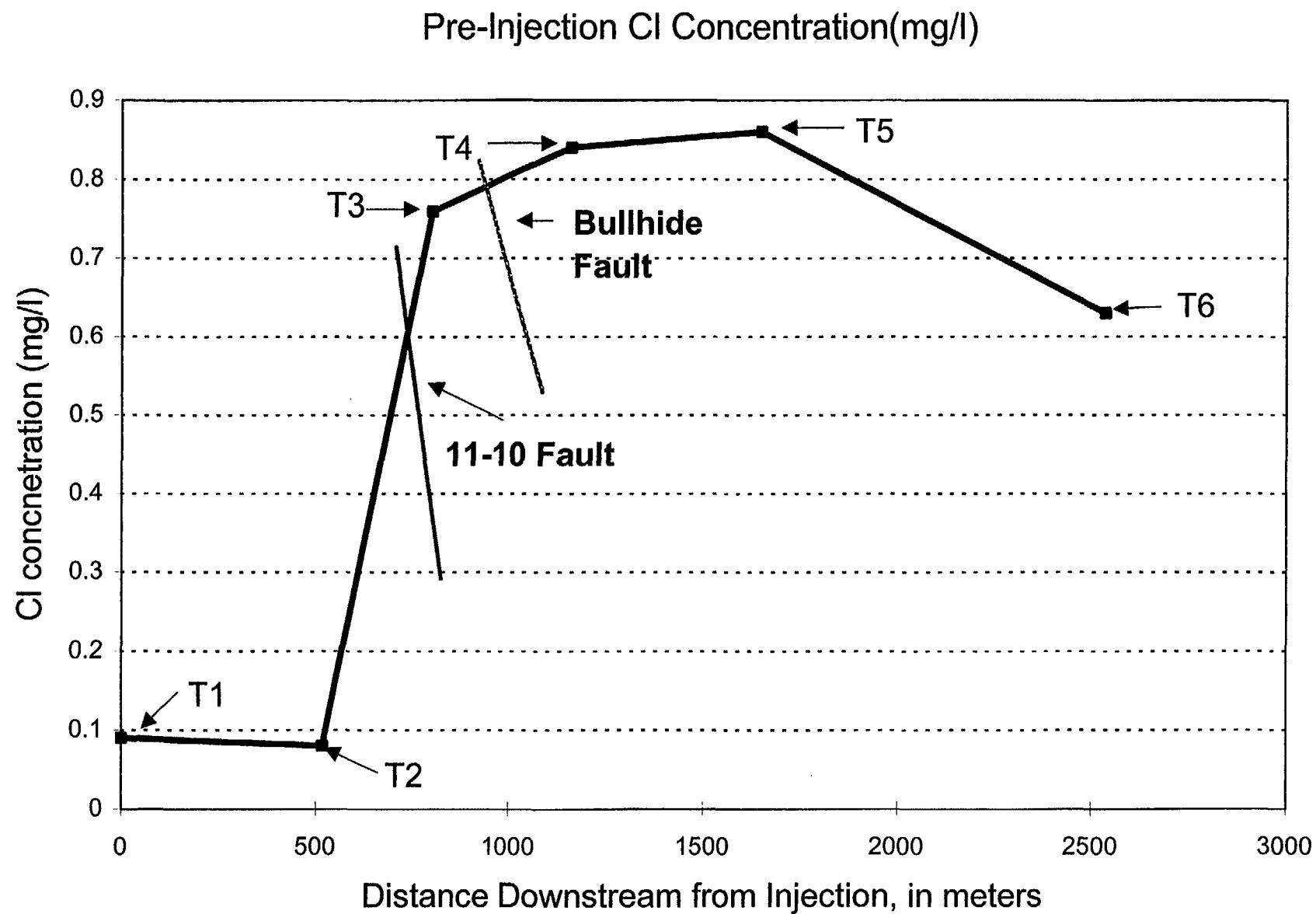
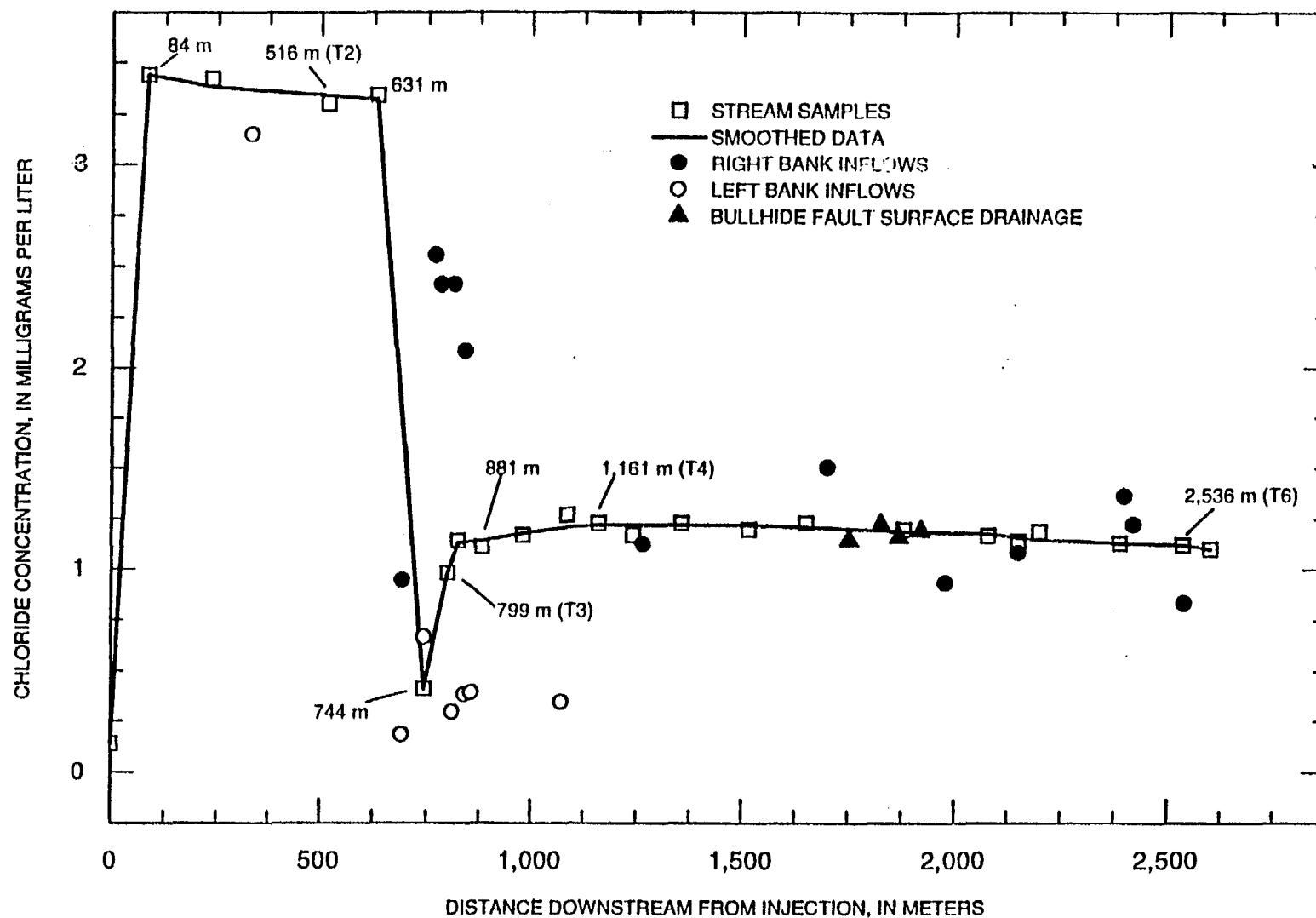


Figure 4-4

Downstream Variation of Chloride Concentration from Synoptic Sampling



From Kimball et. al., 1997

Figure 4-5

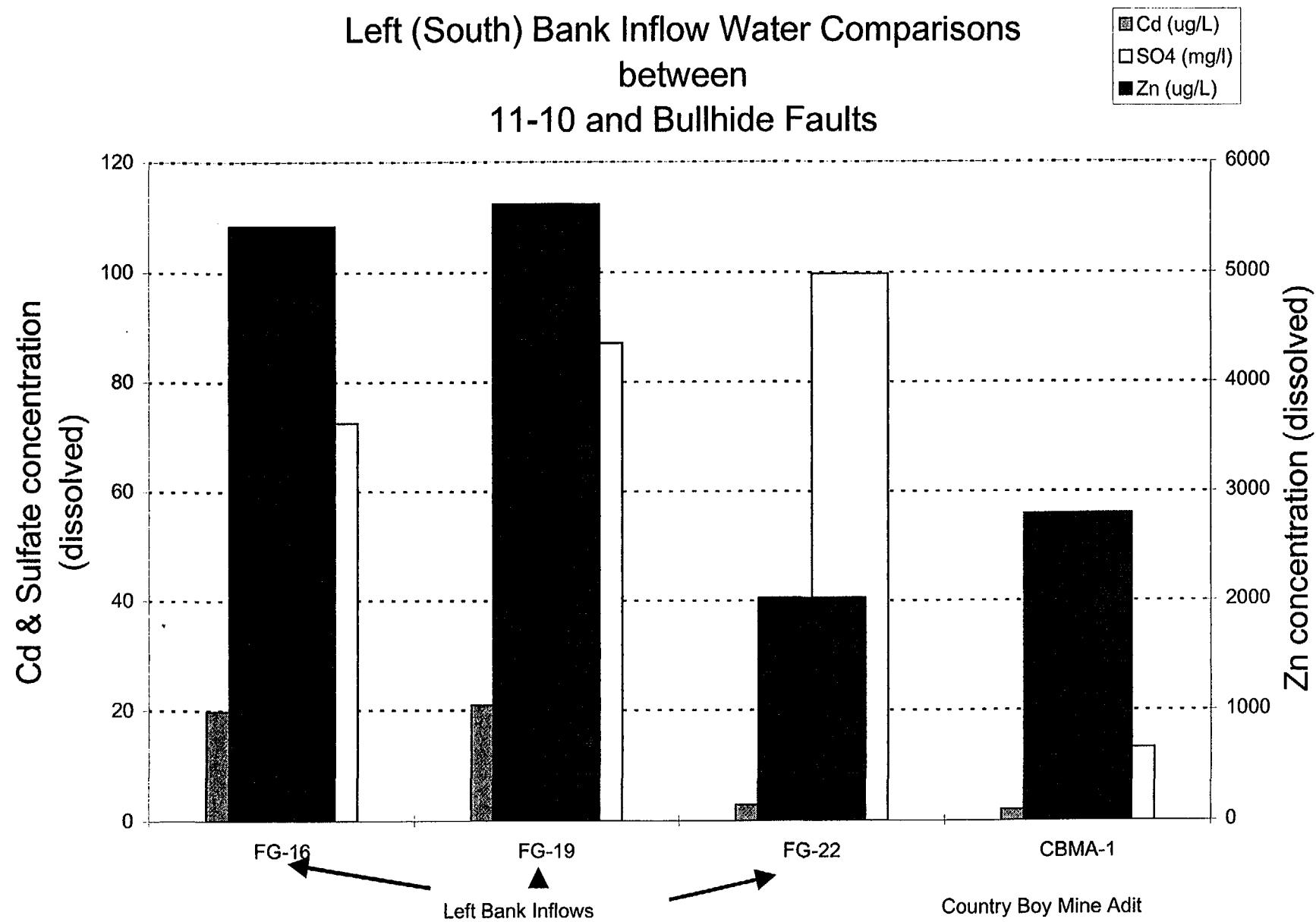
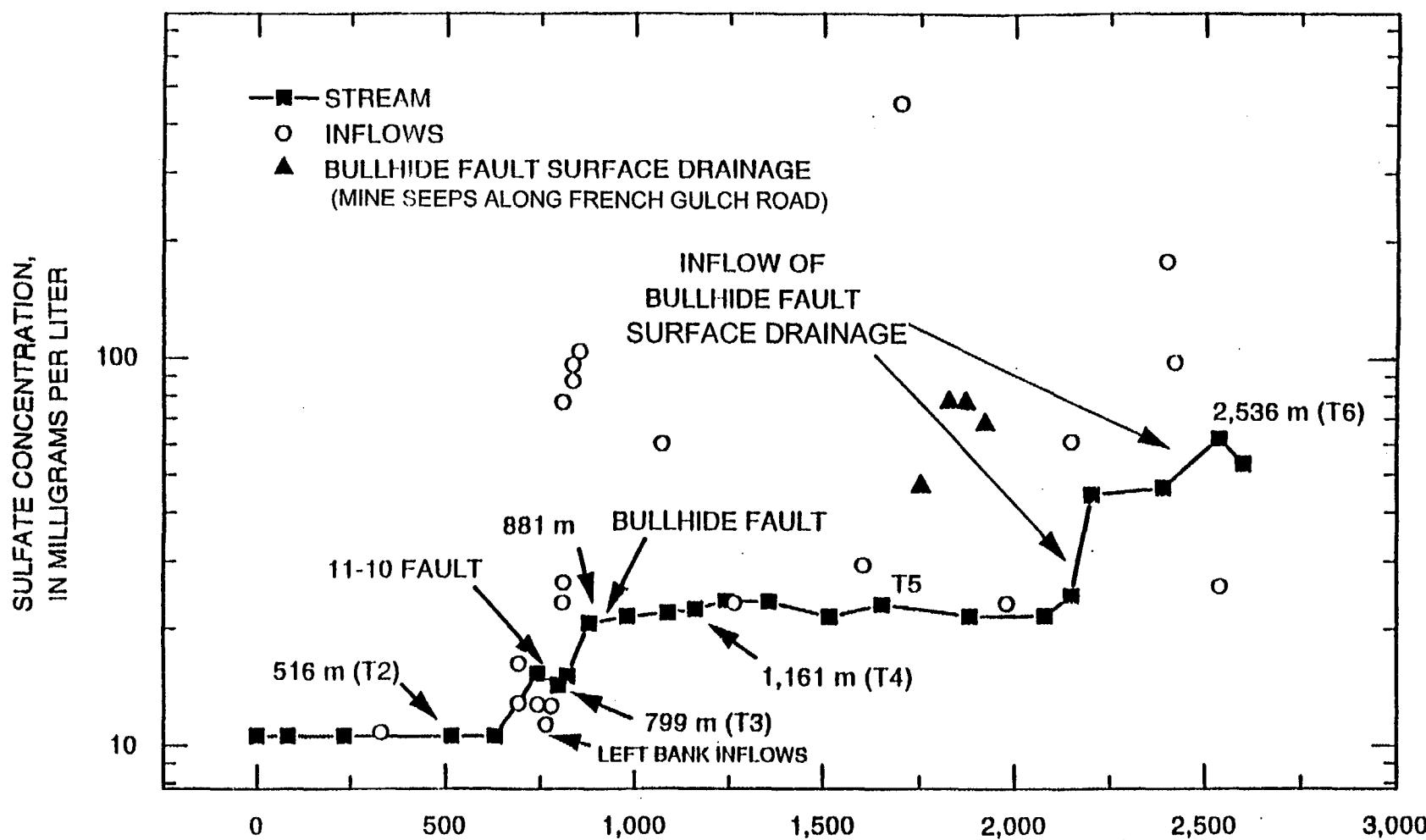


Figure 4-6

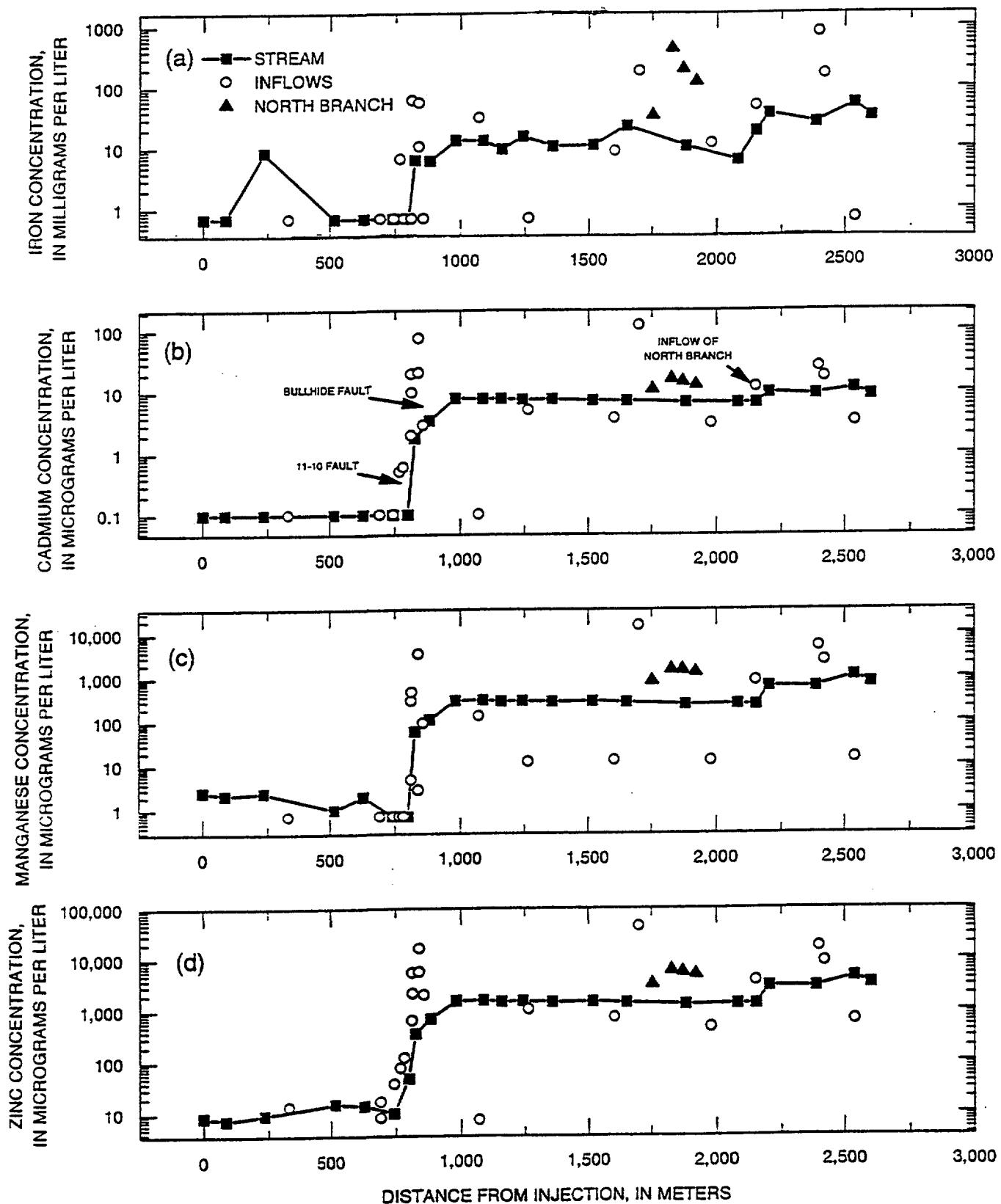
Downstream Variation of Instream and Inflow Sulfate Concentrations



From Kimball et. al., 1997

Figure 4-7

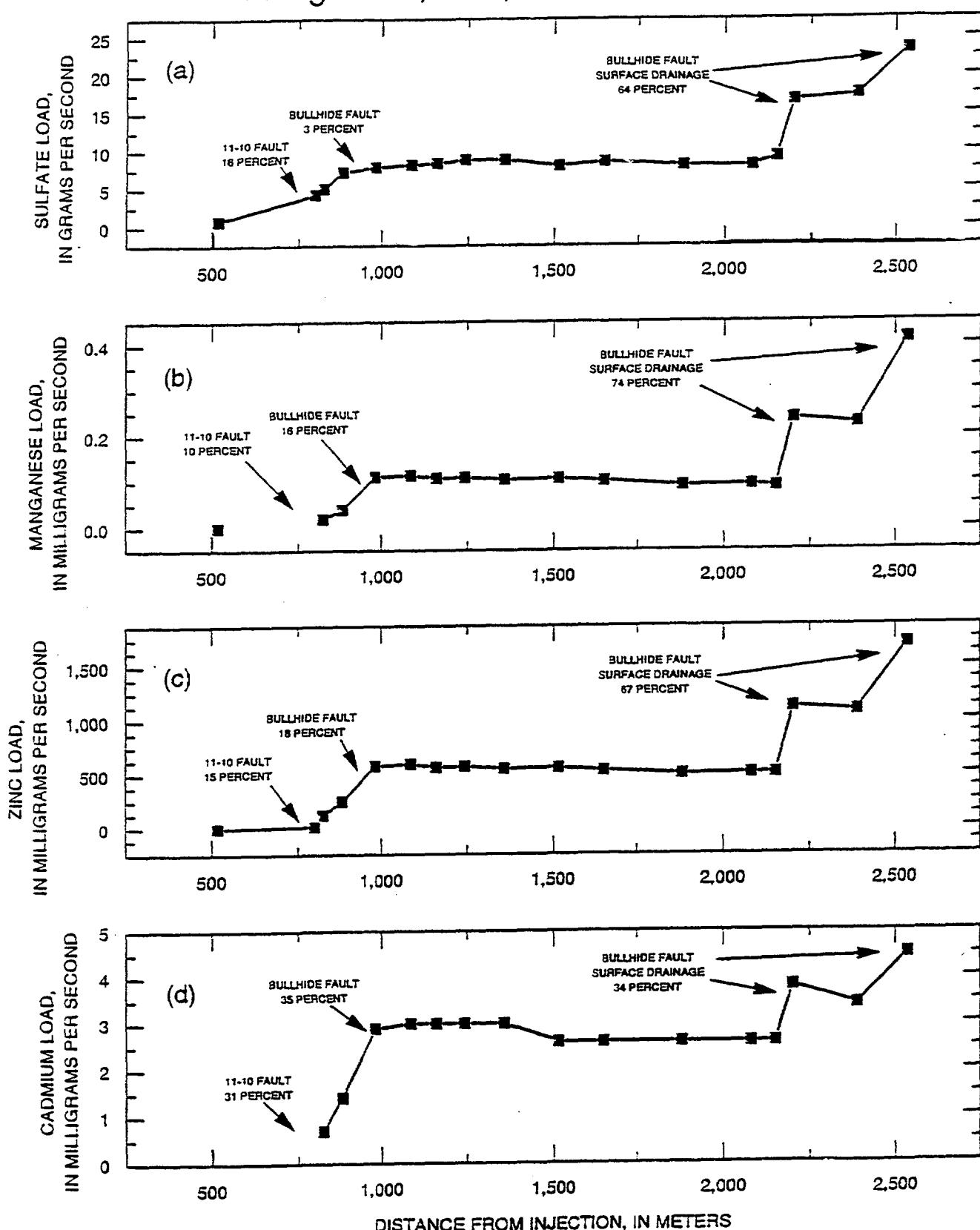
Downstream Variation of Concentration for Iron, Cadmium, Manganese, and Zinc



From Kimball et. al., 1997

Figure 4-8

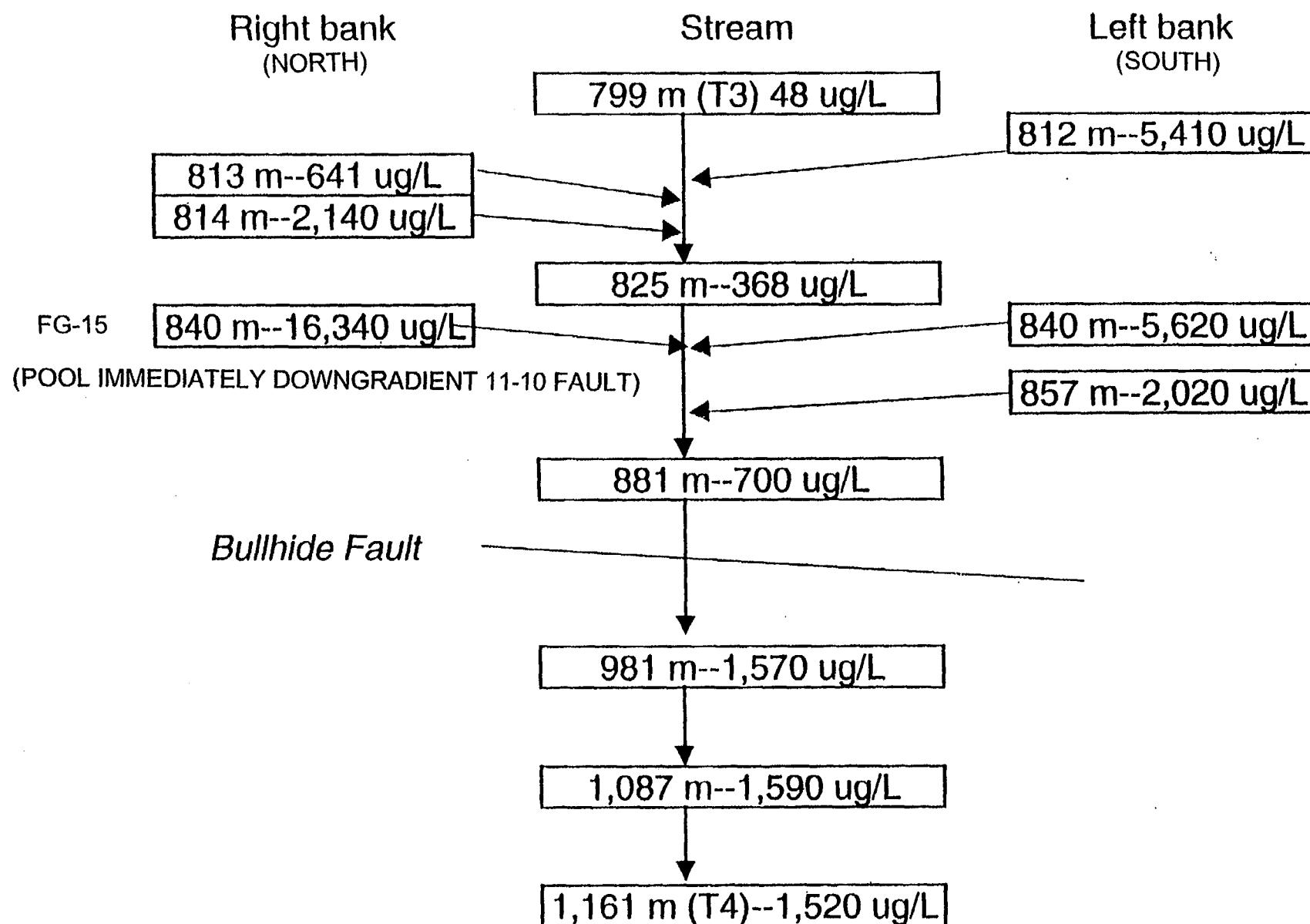
Downstream Variation of Mass Loading for Sulfate, Manganese, Zinc, and Cadmium



From Kimball et. al., 1997

Figure 4-9

Detail of Zinc Concentration between Sites T3 and T4



From Kimball et. al., 1997

Figure 4-10

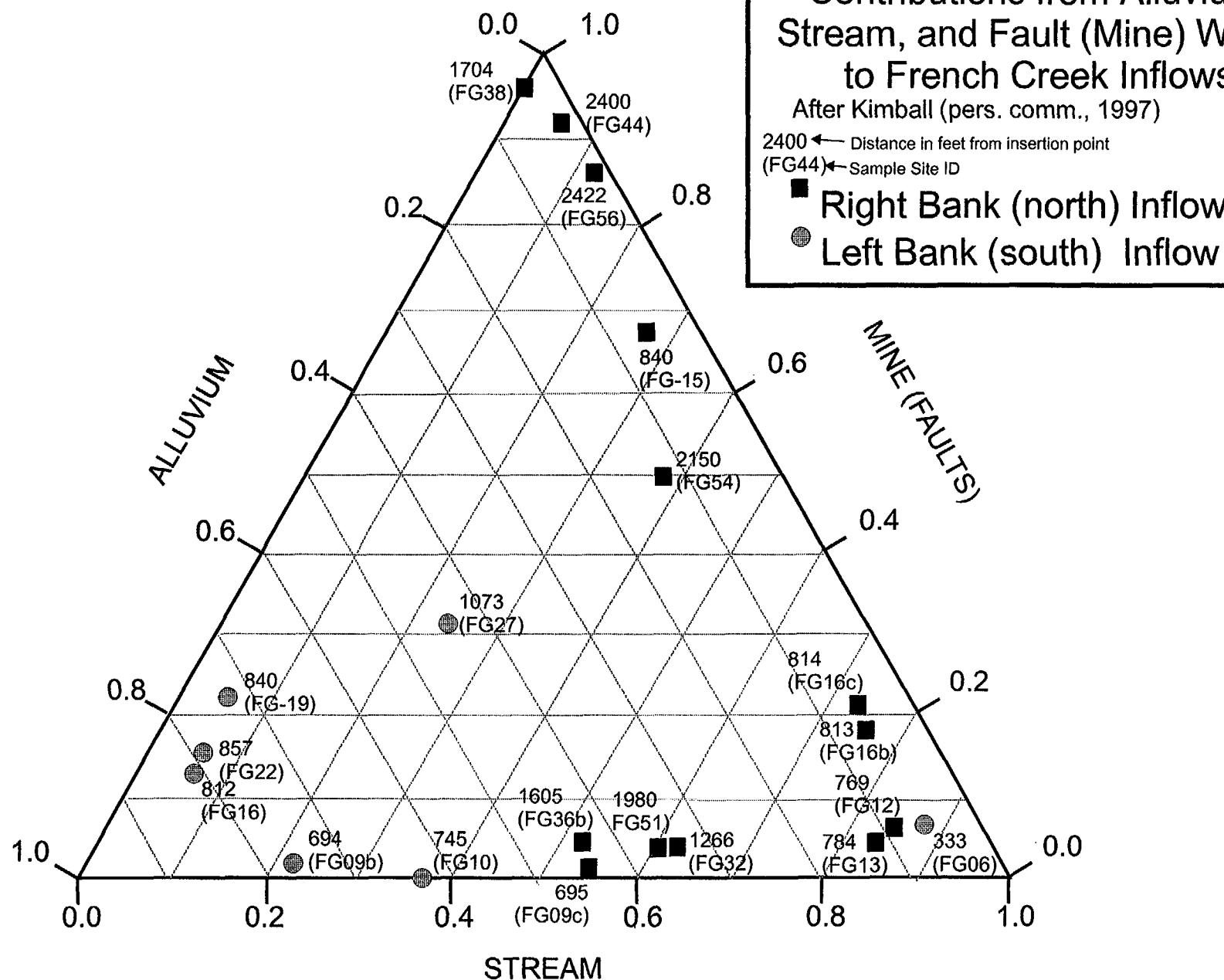
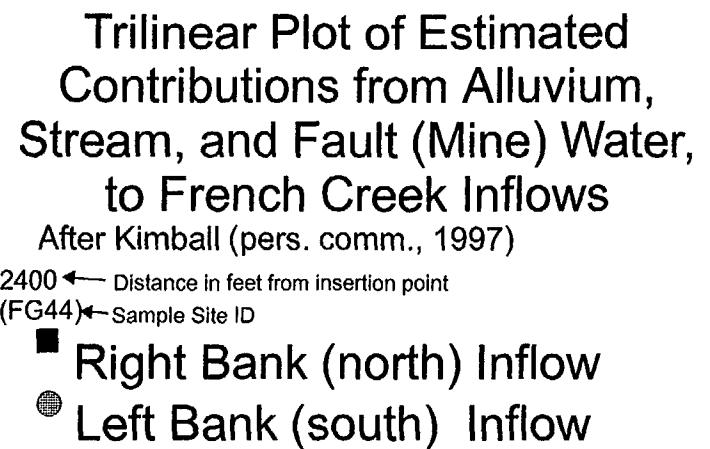
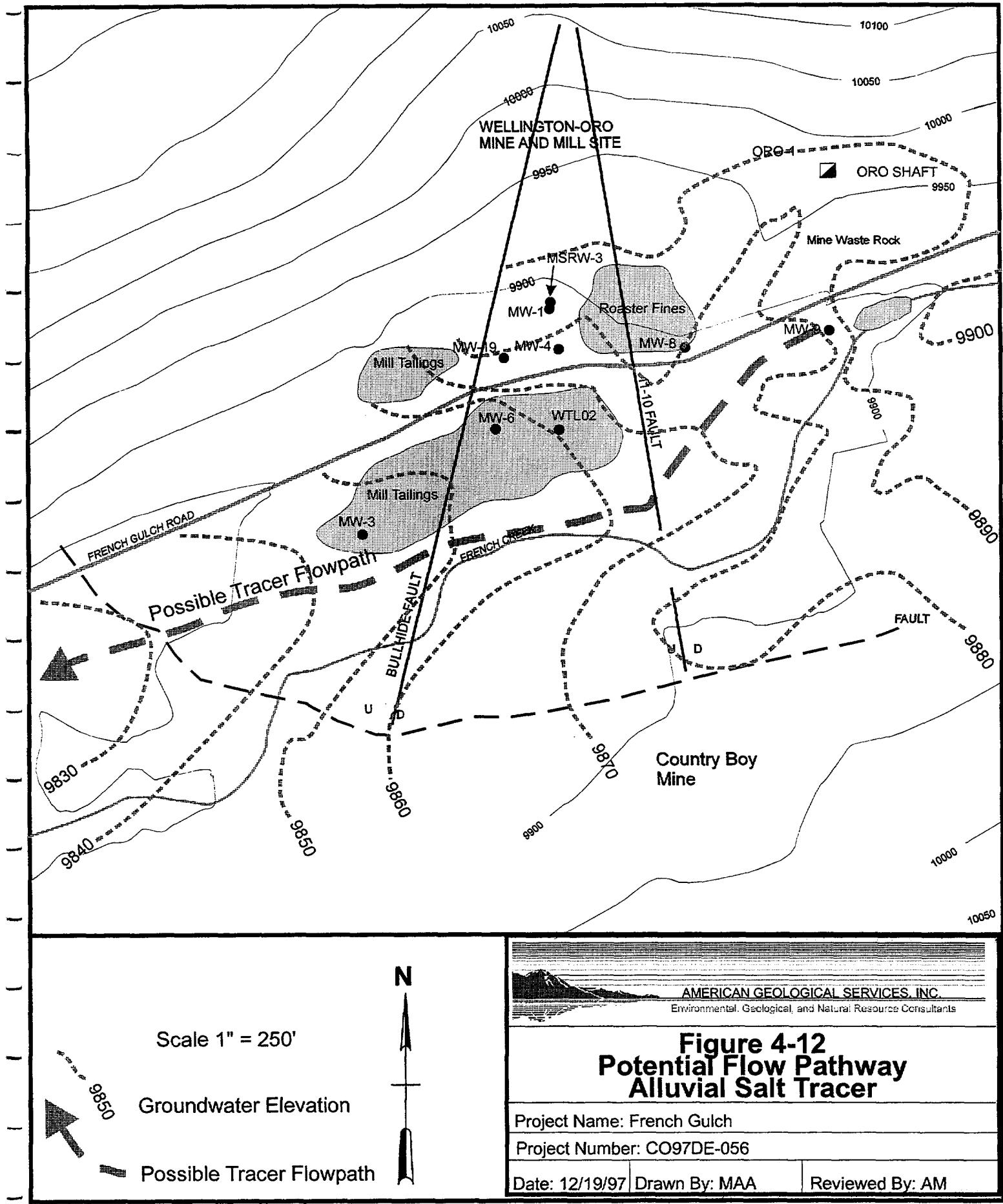


Figure 4-11



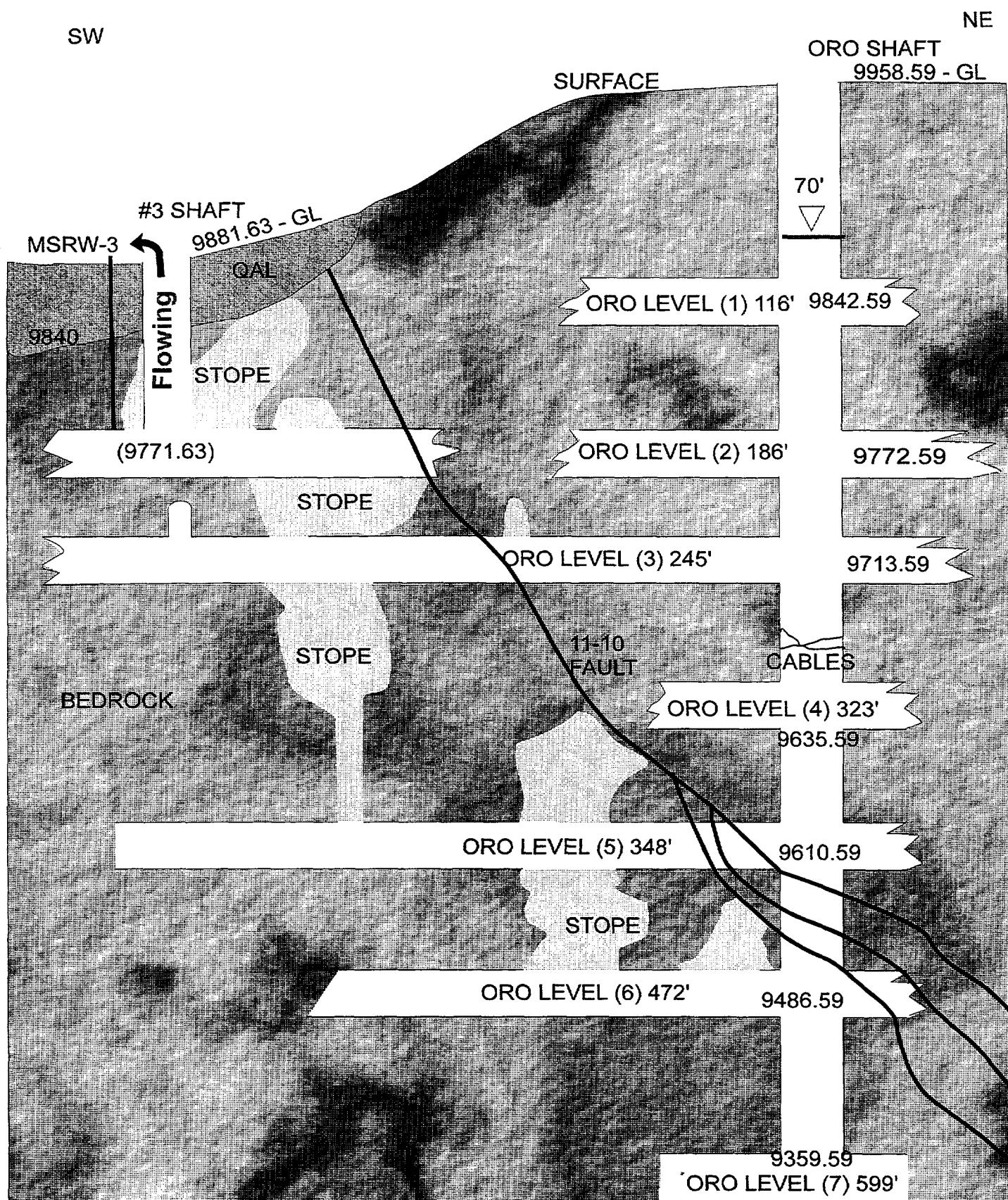


FIGURE 4-13
SCHEMATIC DIAGRAM OF THE ORO AND #3 SHAFTS

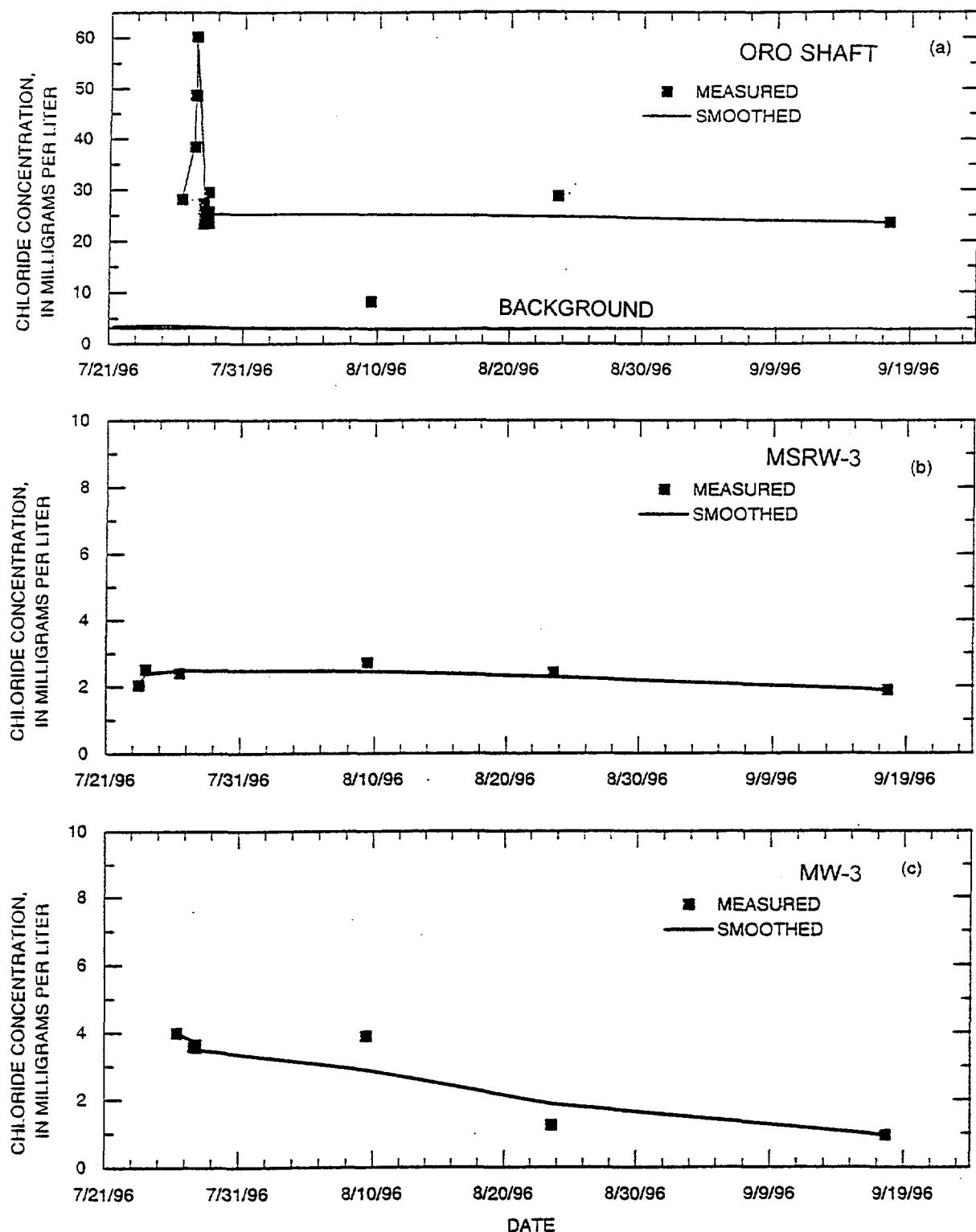
NOT TO SCALE

High Flow Conditions

DRAFTED BY AMERICAN GEOLOGICAL SERVICES, INC
AFTER LOVERING (1934)

DEPTH MEASURED FROM ORO SURFACE

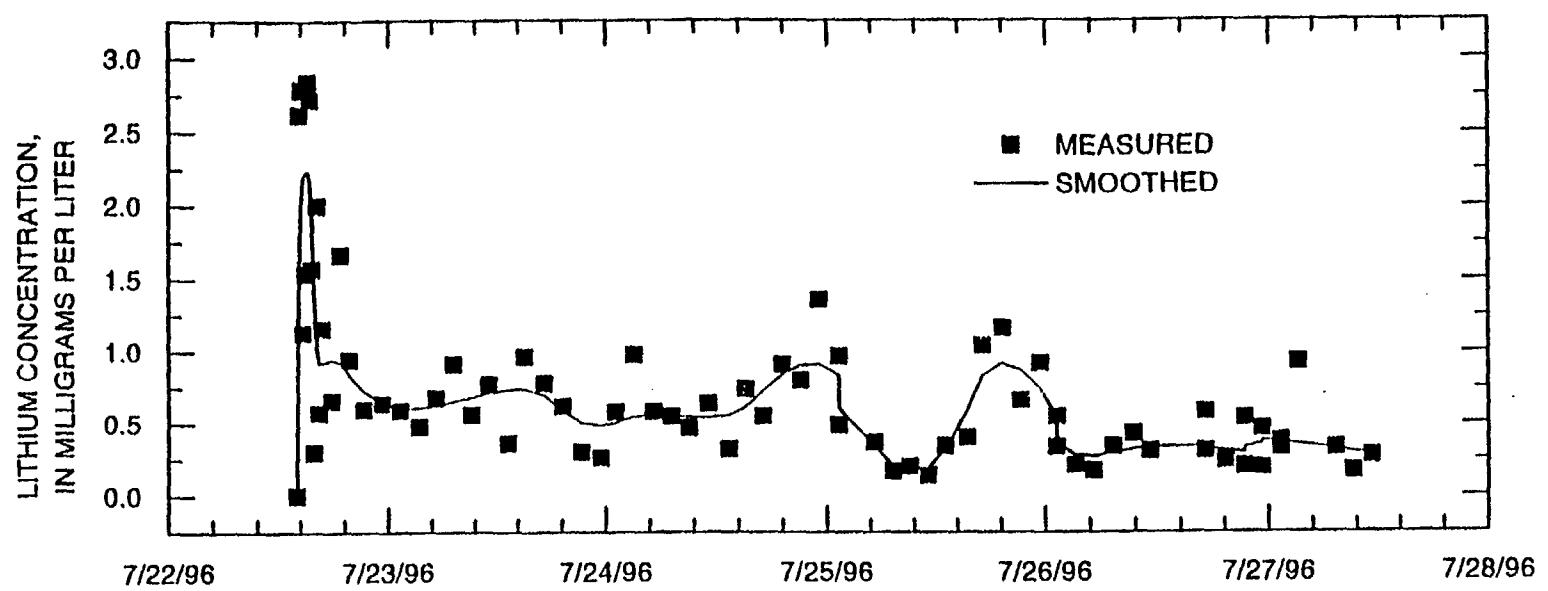
Variation of Chloride Concentration in the Oro Shaft, MSRW-3 (#3 Mine), and Alluvial Well MW-3



From Kimball et. al., 1997

Figure 4-14

Variation of Lithium Concentration in the Oro Shaft



From Kimball et. al., 1997

Figure 4-15

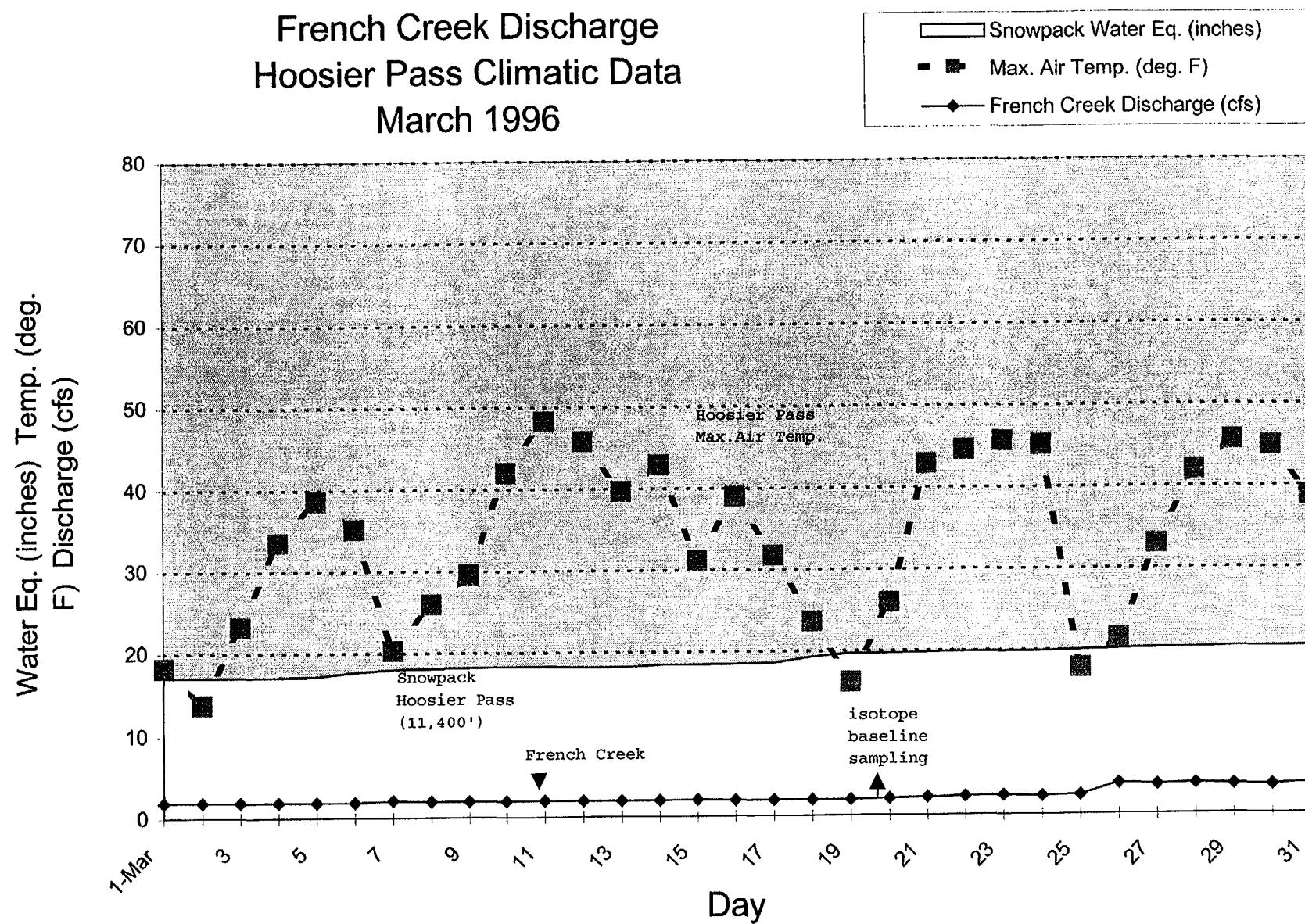


Figure 5-1

French Creek Discharge
Dillon Reservoir Climatic Data
March 1996

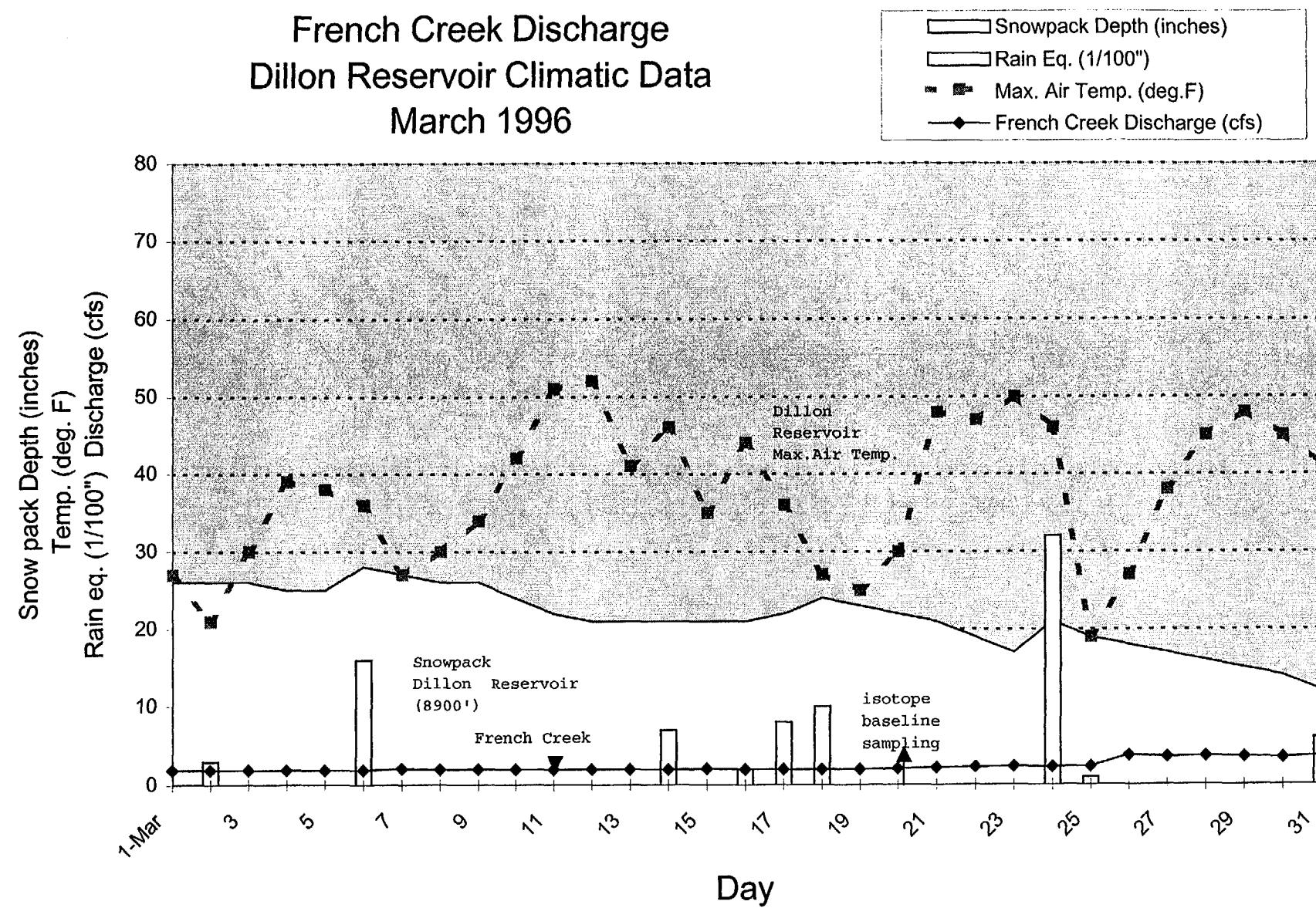
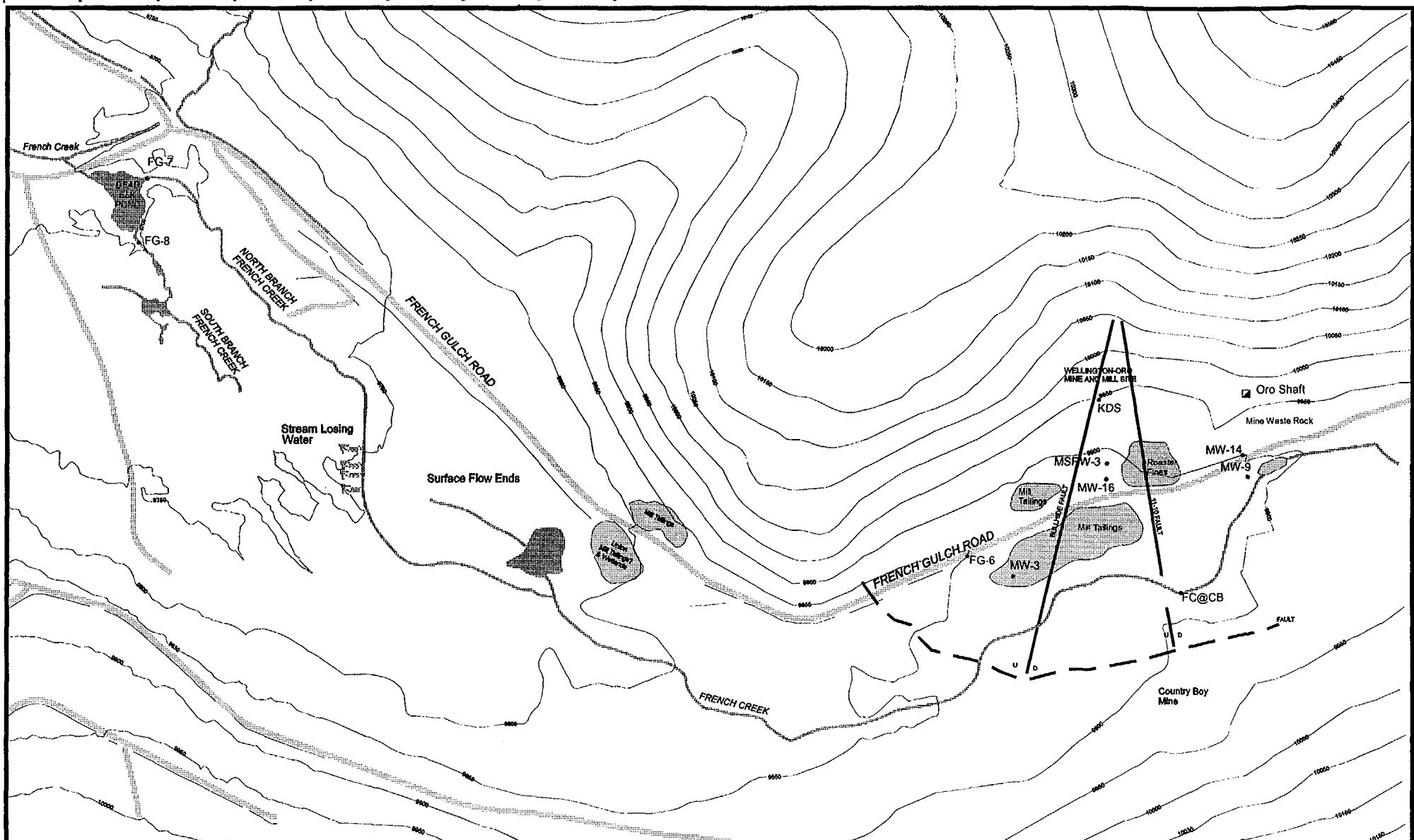


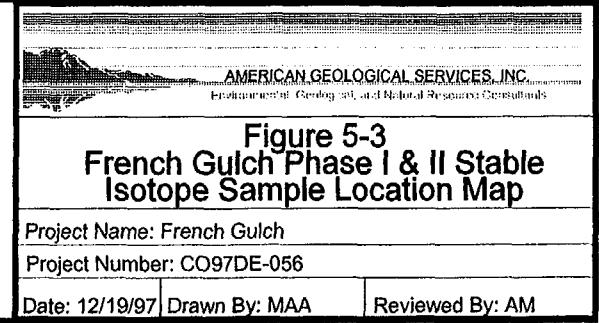
Figure 5-2



0 400 800 FEET

N

• MW-16 Sample Location



French Gulch Stable Isotope Baseline results

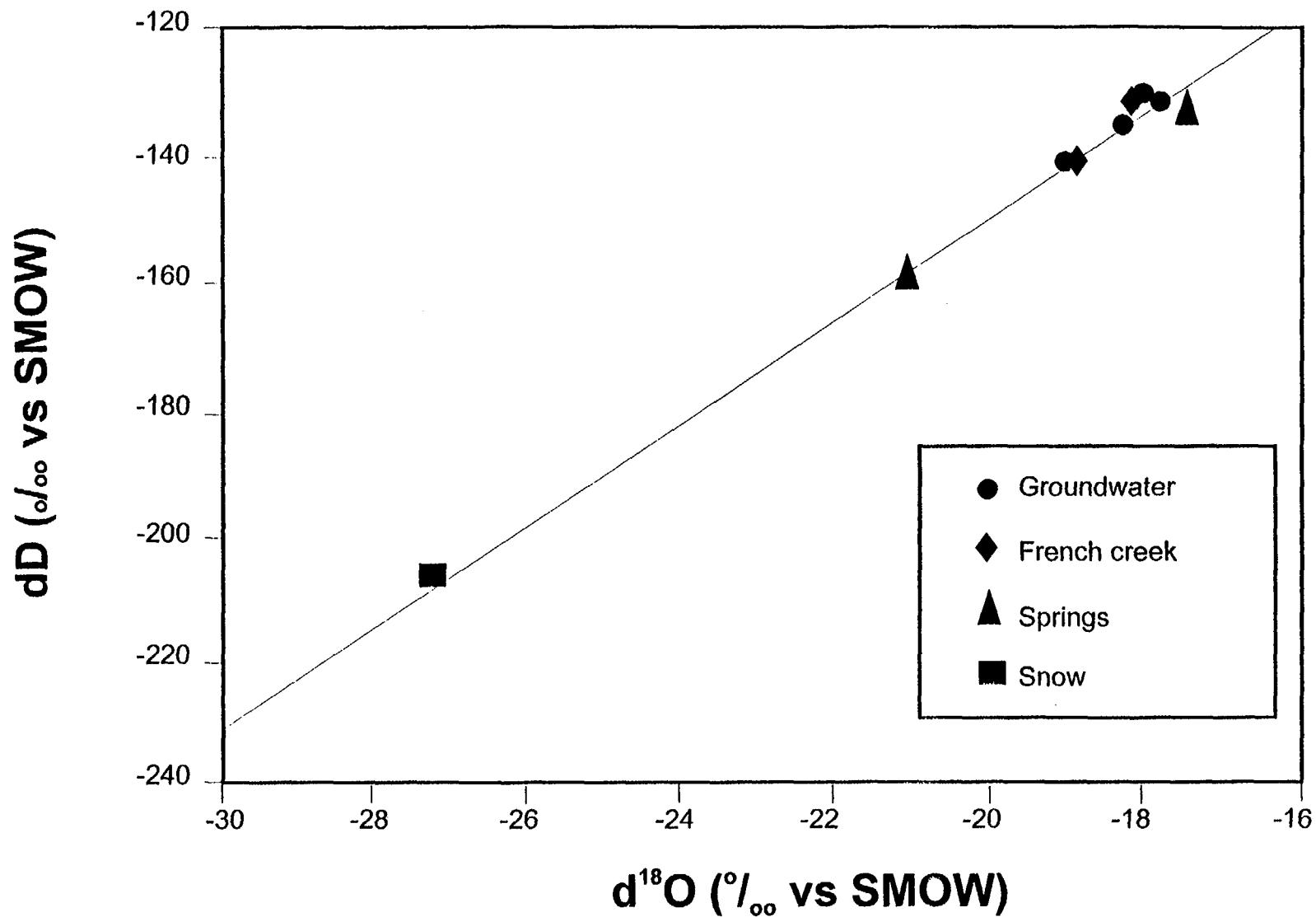


Figure 5-4

Phase I March 1996 Low Flow
Stable Isotope Data - 3/20/96

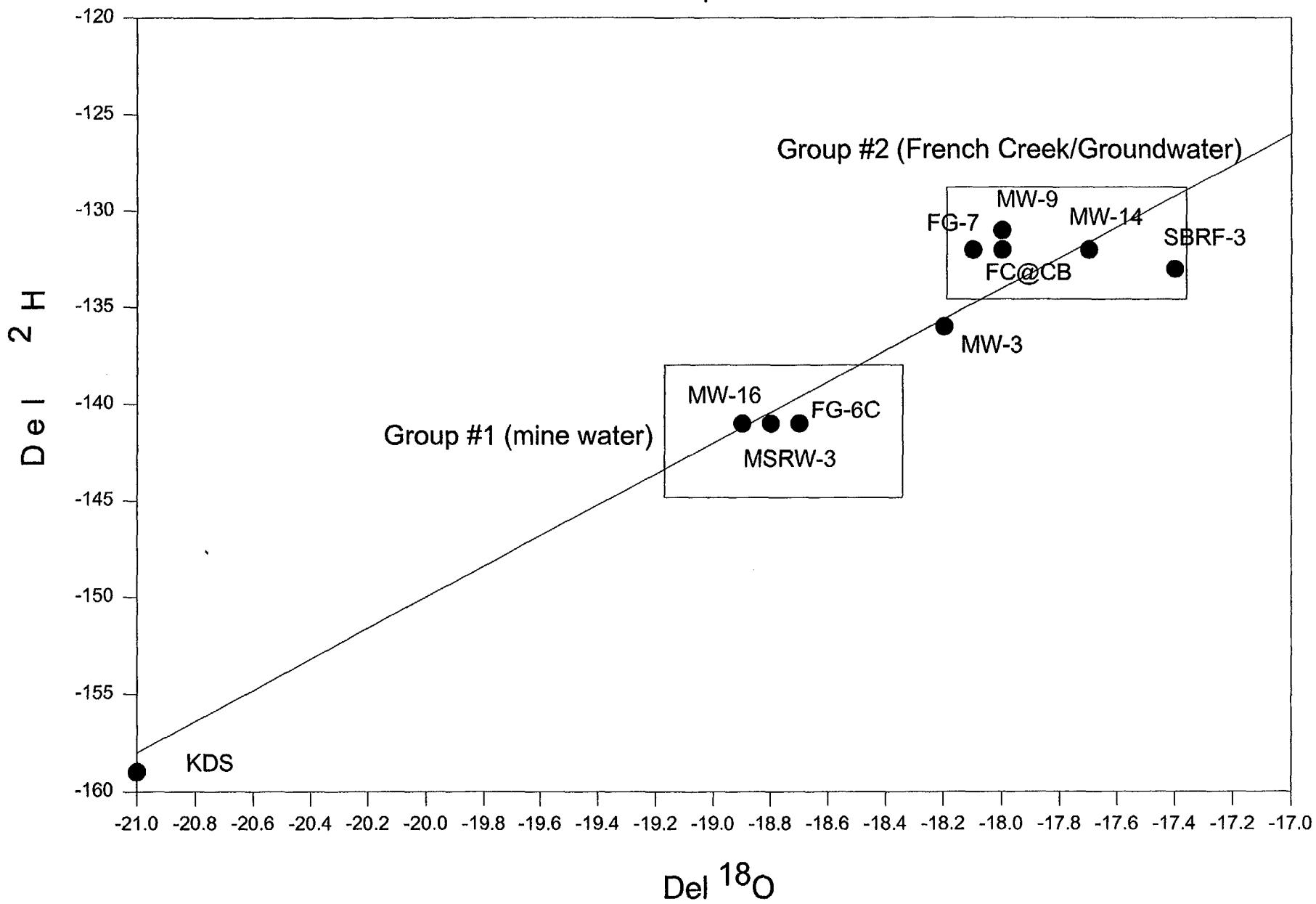


Figure 5-5

French Creek Discharge
Hoosier Pass Climatic Data
May 1996

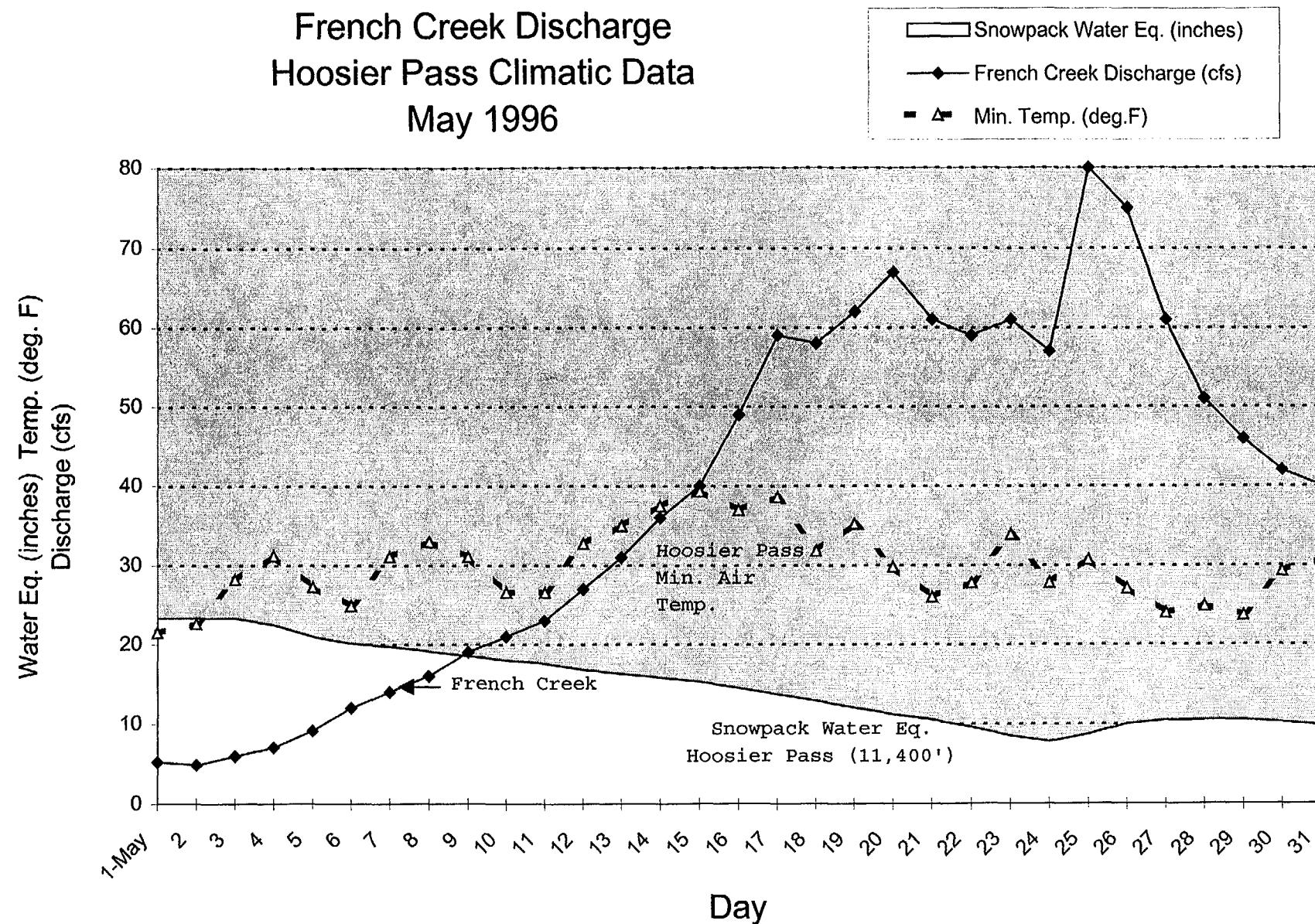


Figure 5-6

French Creek Discharge
Dillon Reservoir Climatic Data
April 1996

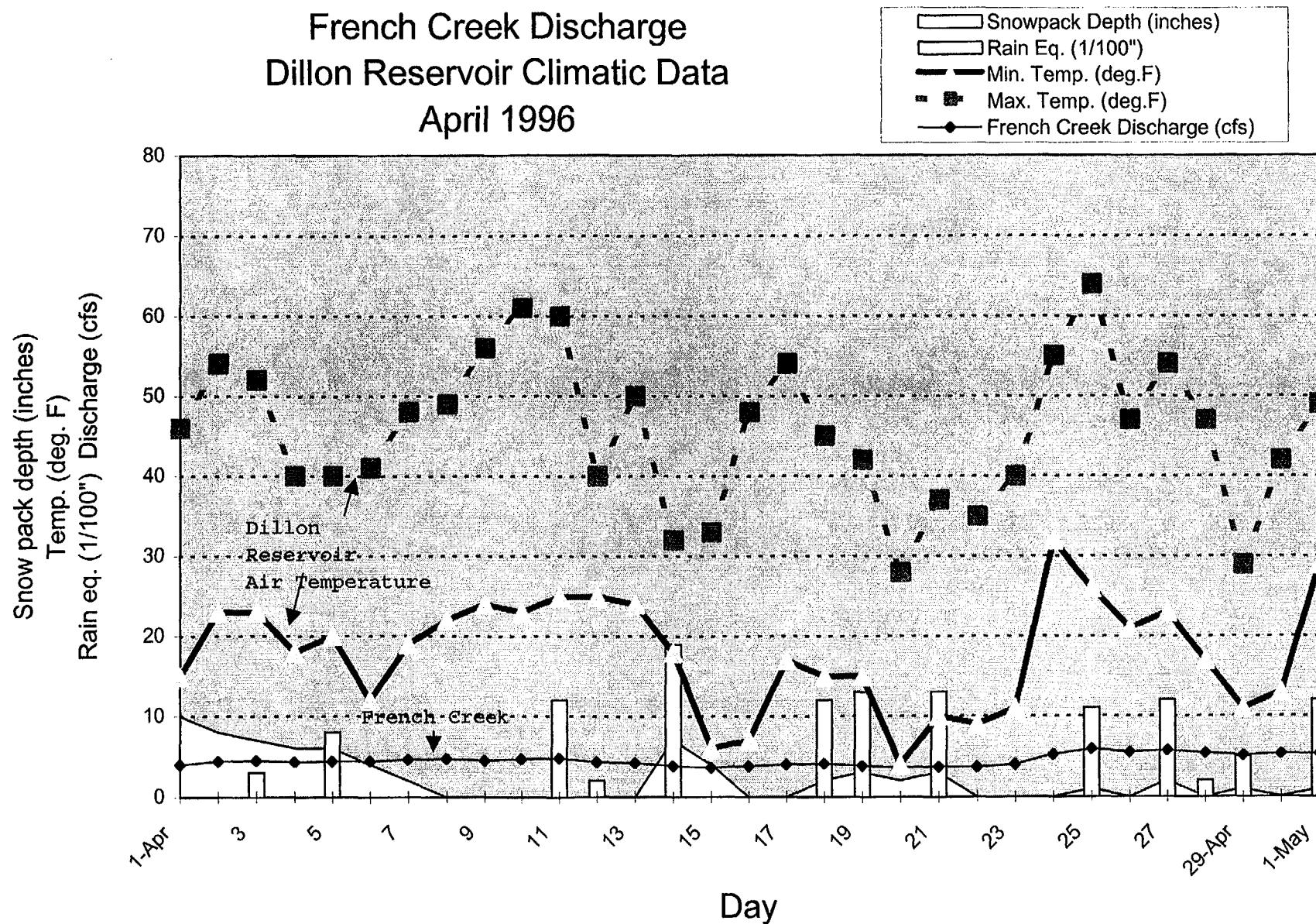


Figure 5-7

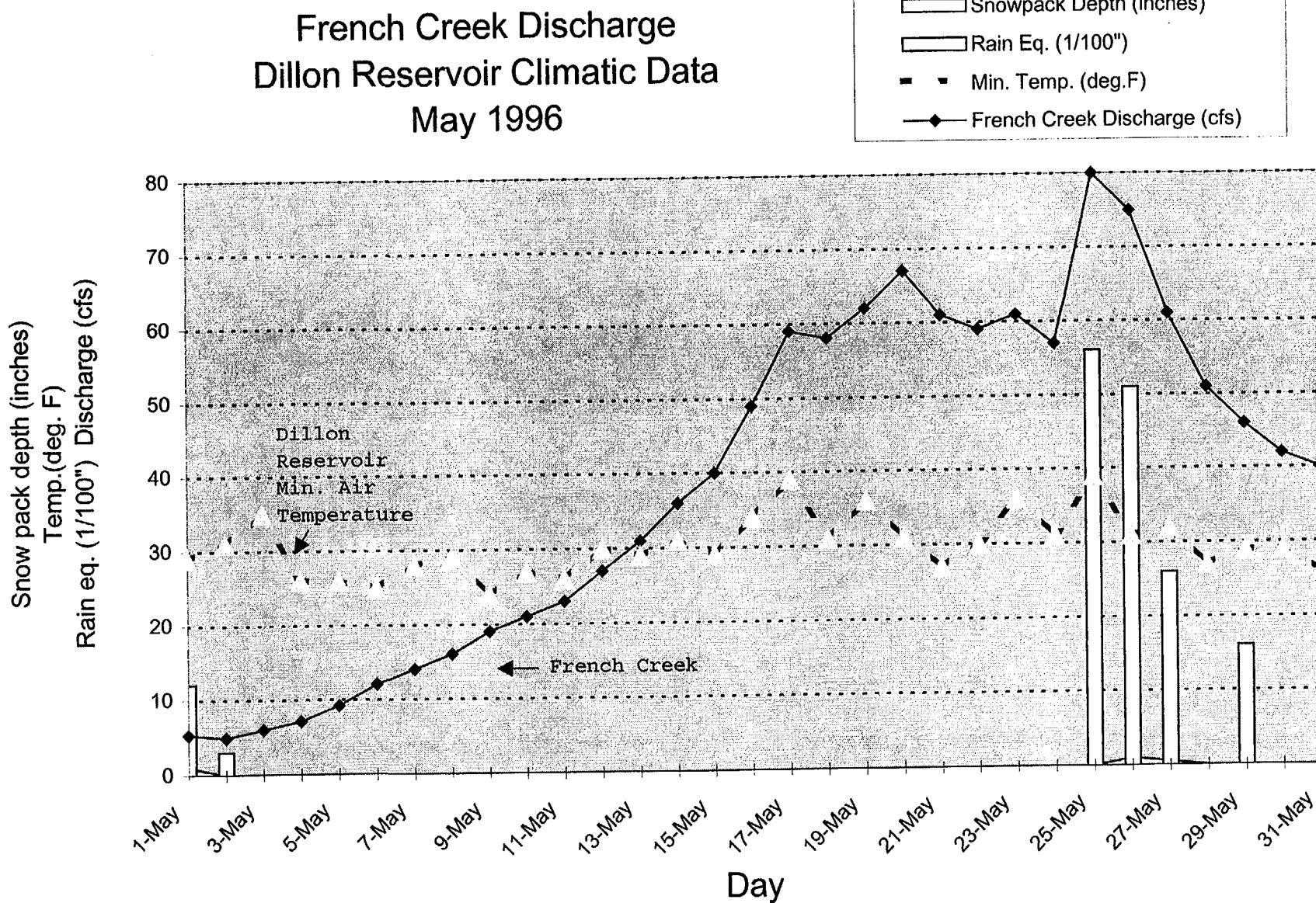


Figure 5-8

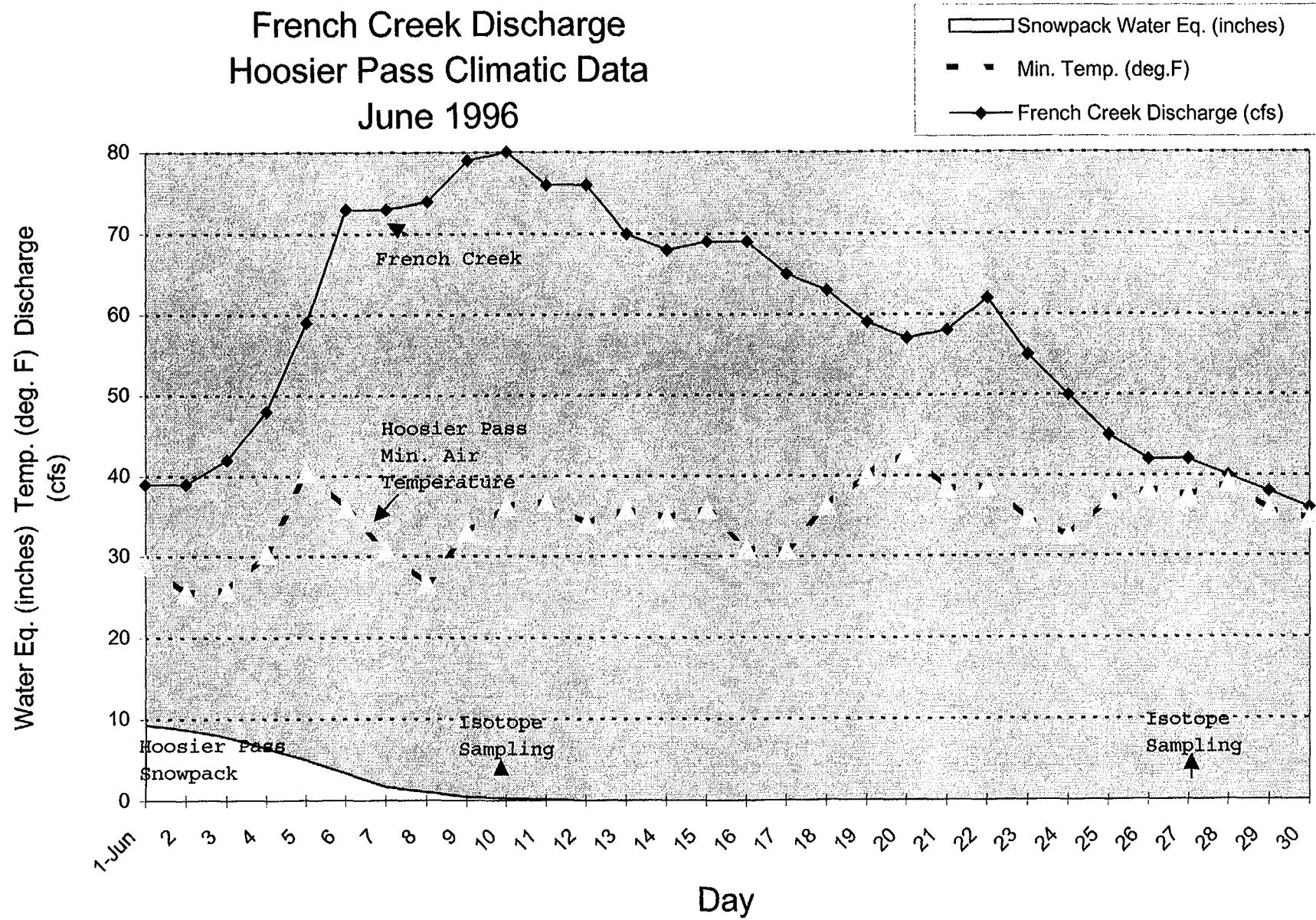


Figure 5-9

Phase II June 1996 High Flow
Stable Isotope Data - 6/10/96

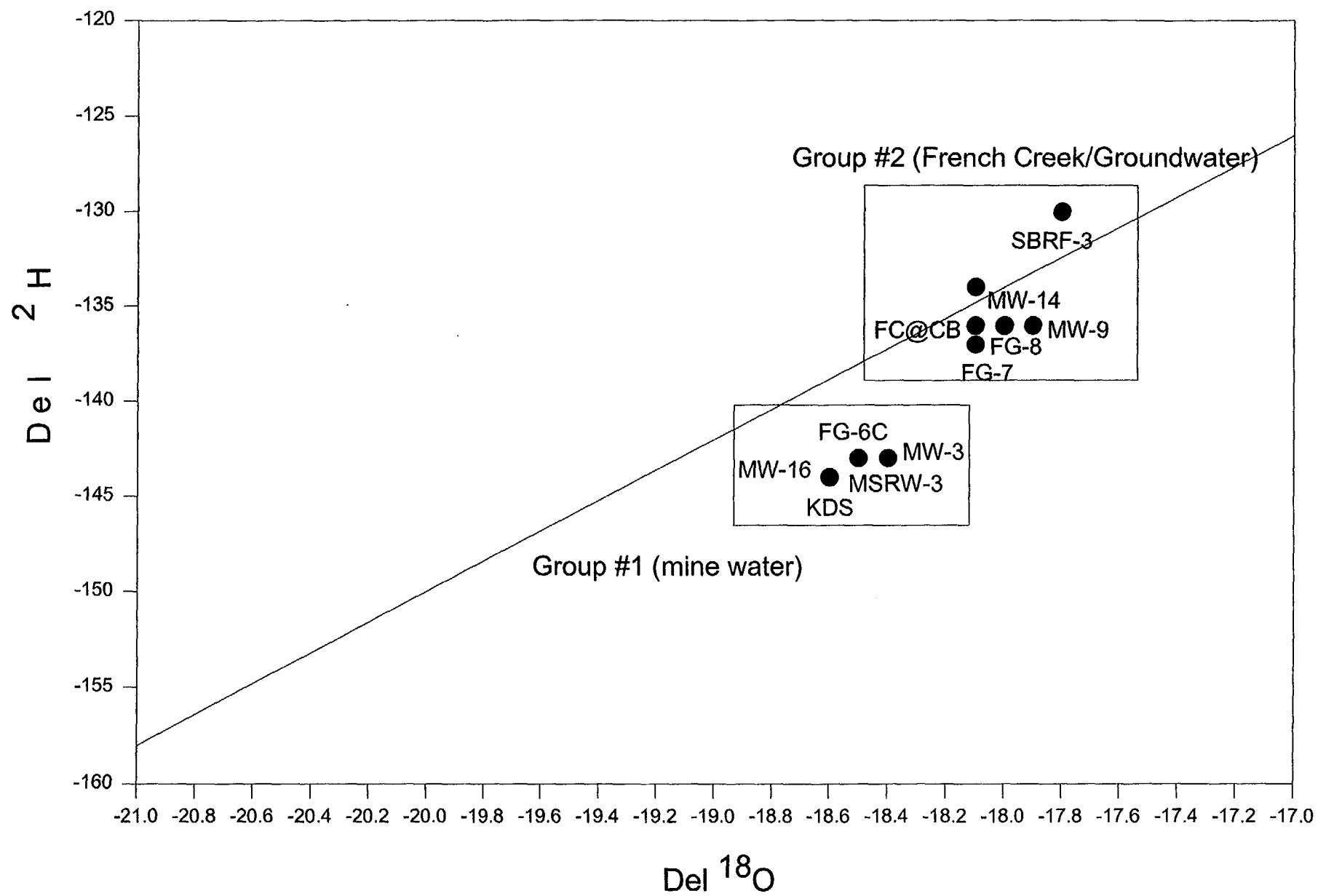


Figure 5-10

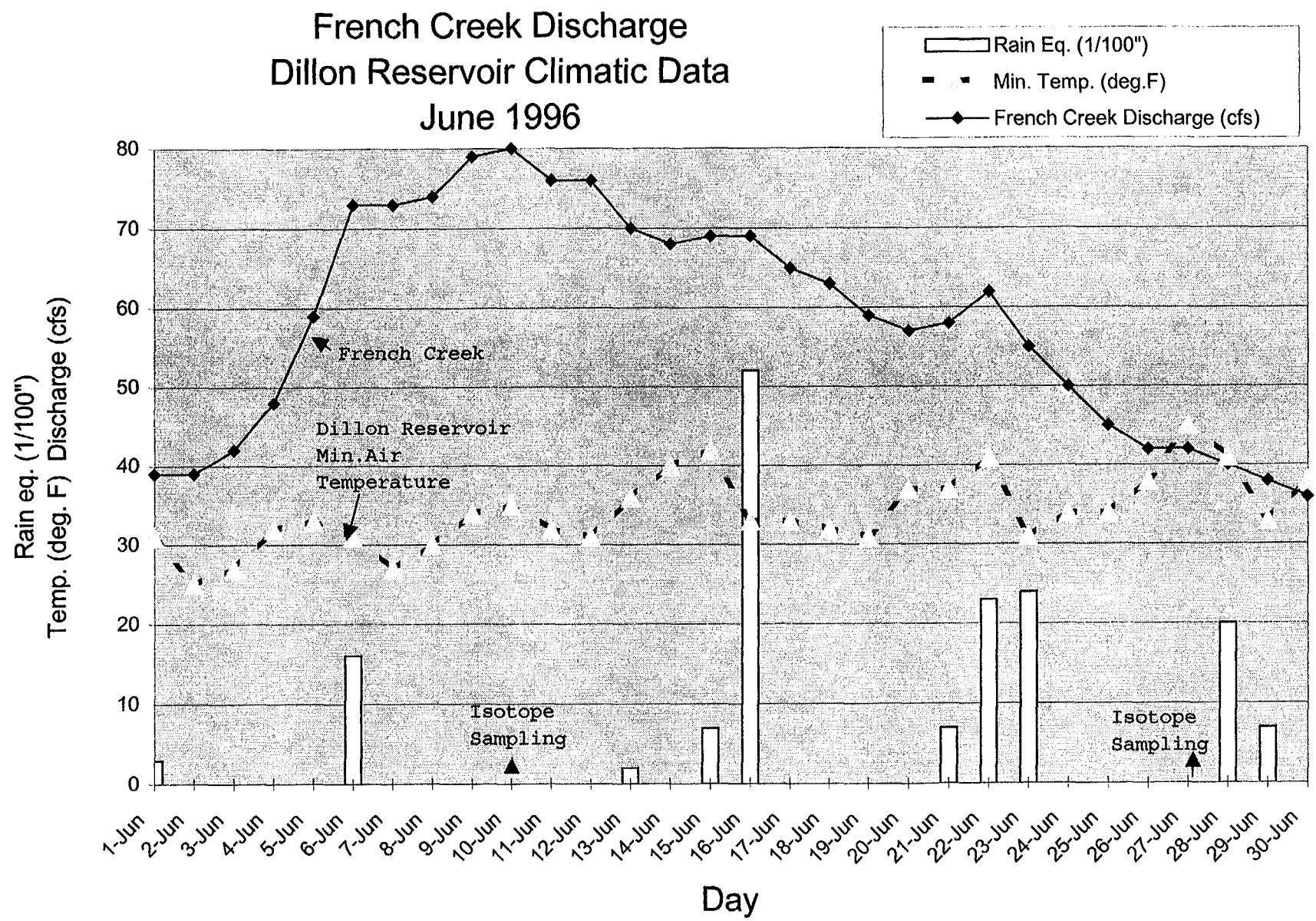


Figure 5-11

Phase II June 1996 High Flow
Stable Isotope Data - 6/27/96

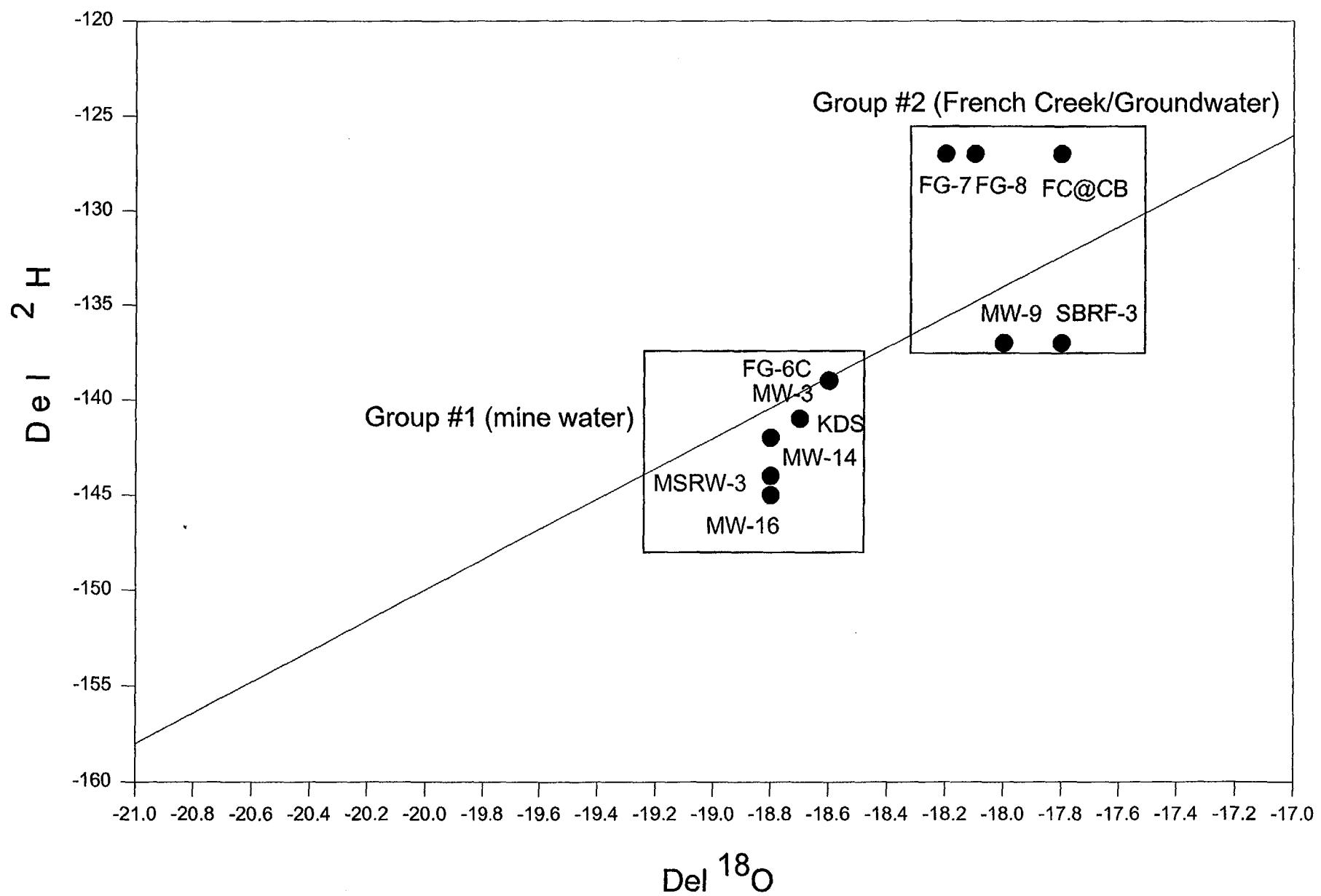


Figure 5-12

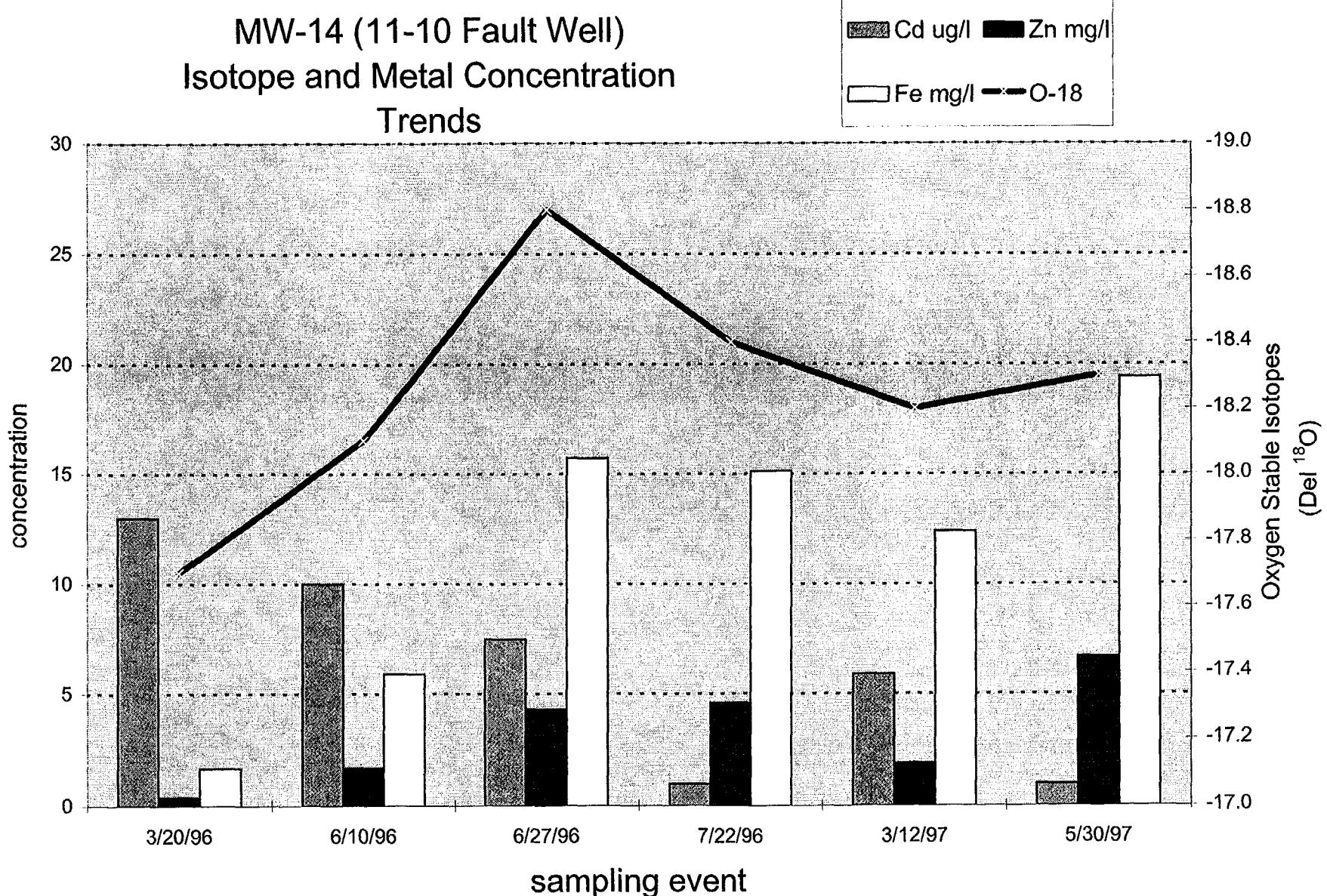


Figure 5-13

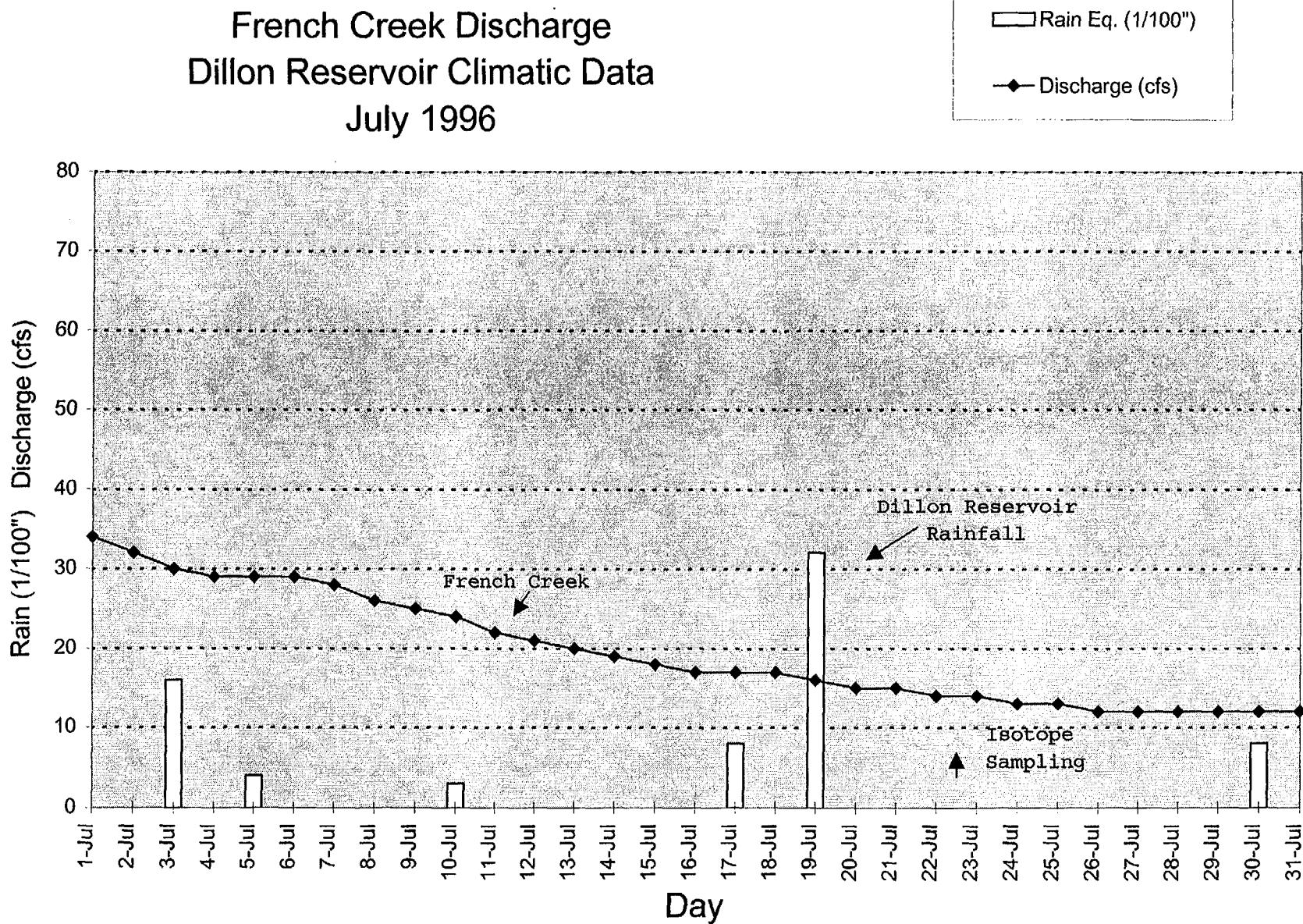


Figure 5-14

Phase II July High Flow
Stable Isotope Data - 7/22/96

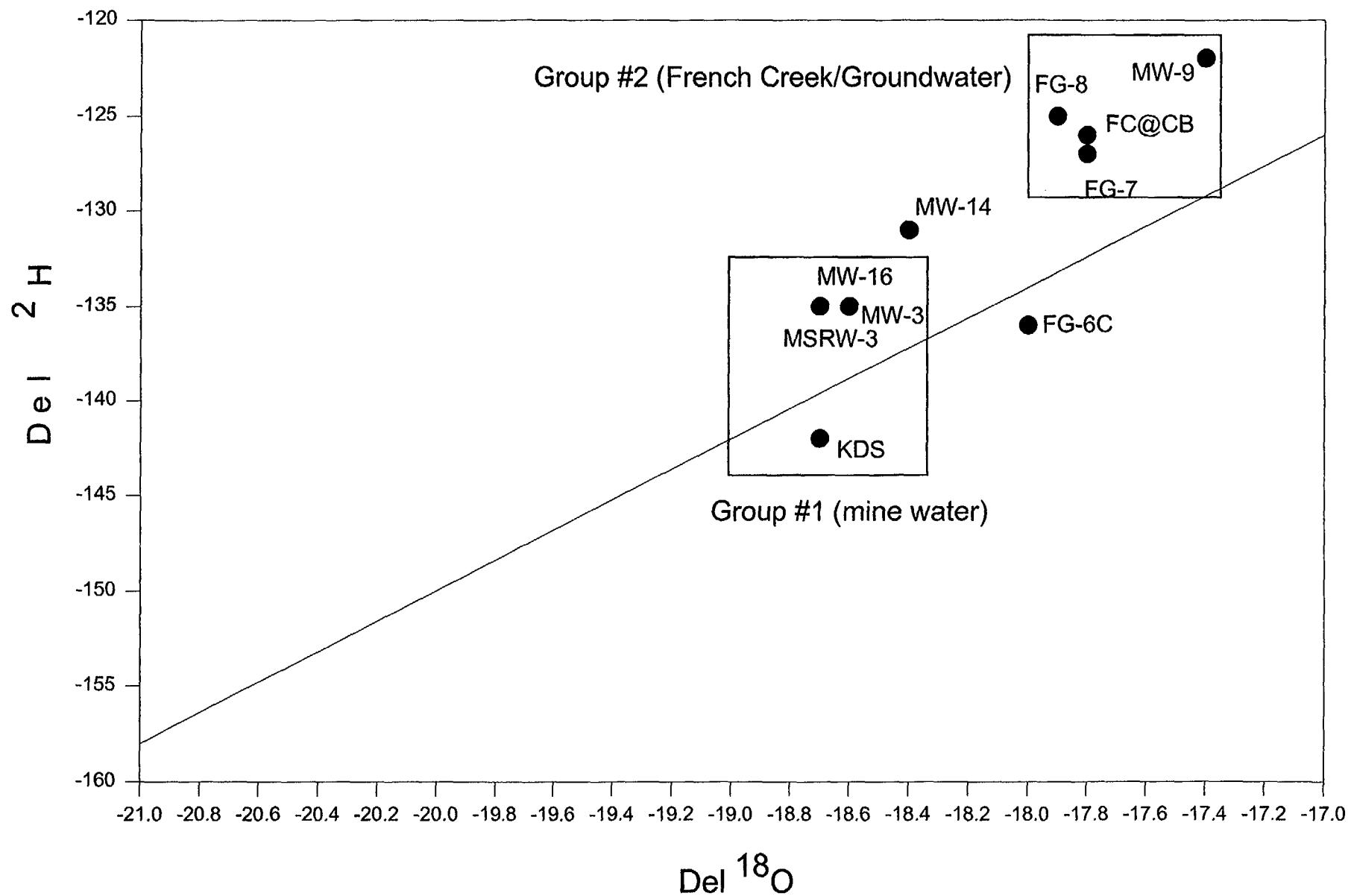


Figure 5-15

French Creek Discharge
Dillon Reservoir Climatic Data
March 1997

- Snowpack Depth (inches)
- Rain Eq. (1/100")
- Max. Air temp. (deg.F)
- Discharge (cfs)

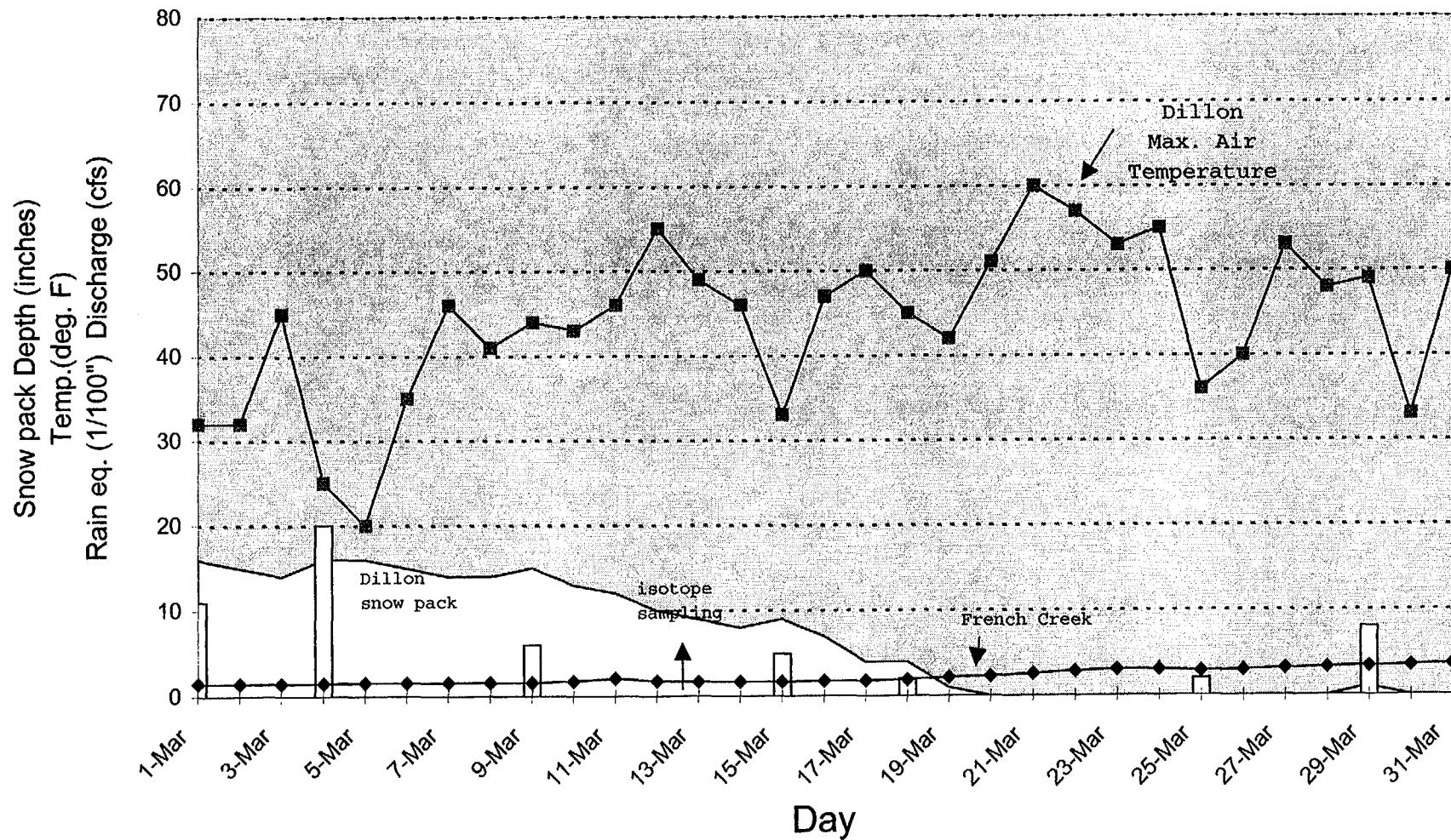


Figure 5-16

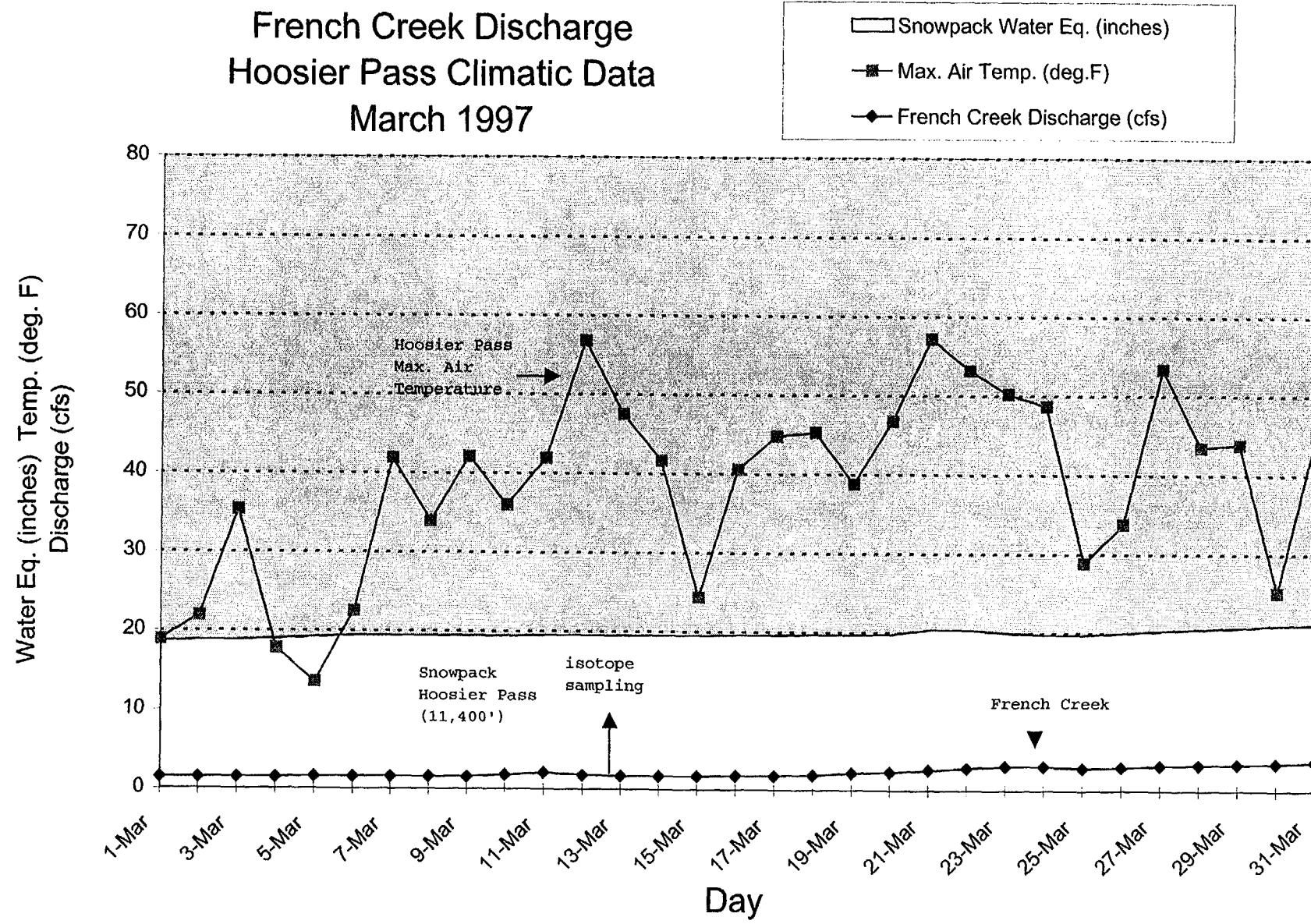


Figure 5-17

Phase III March 1997 Low Flow
Stable Isotope Data - 3/12-13/97

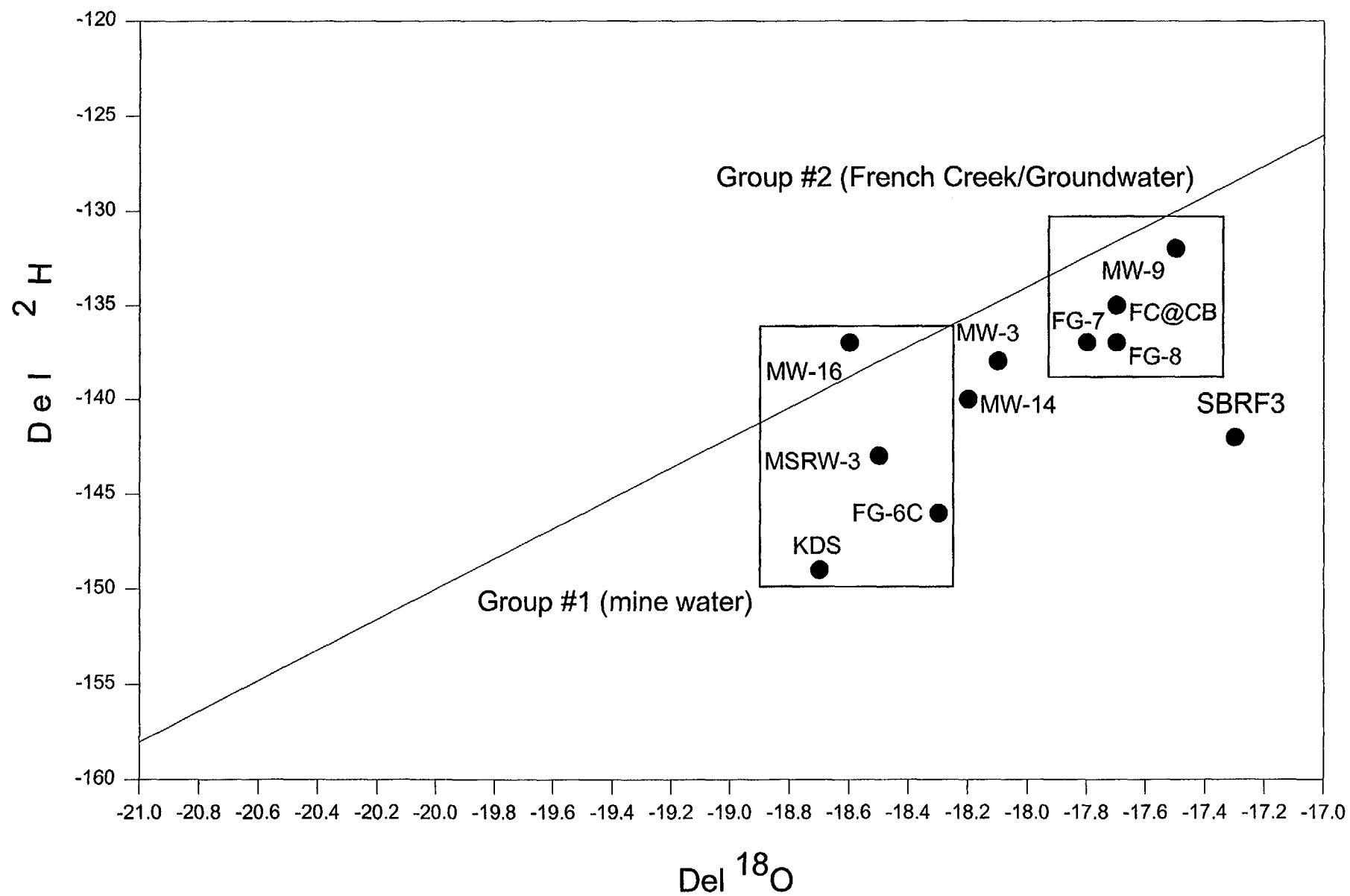


Figure 5-18

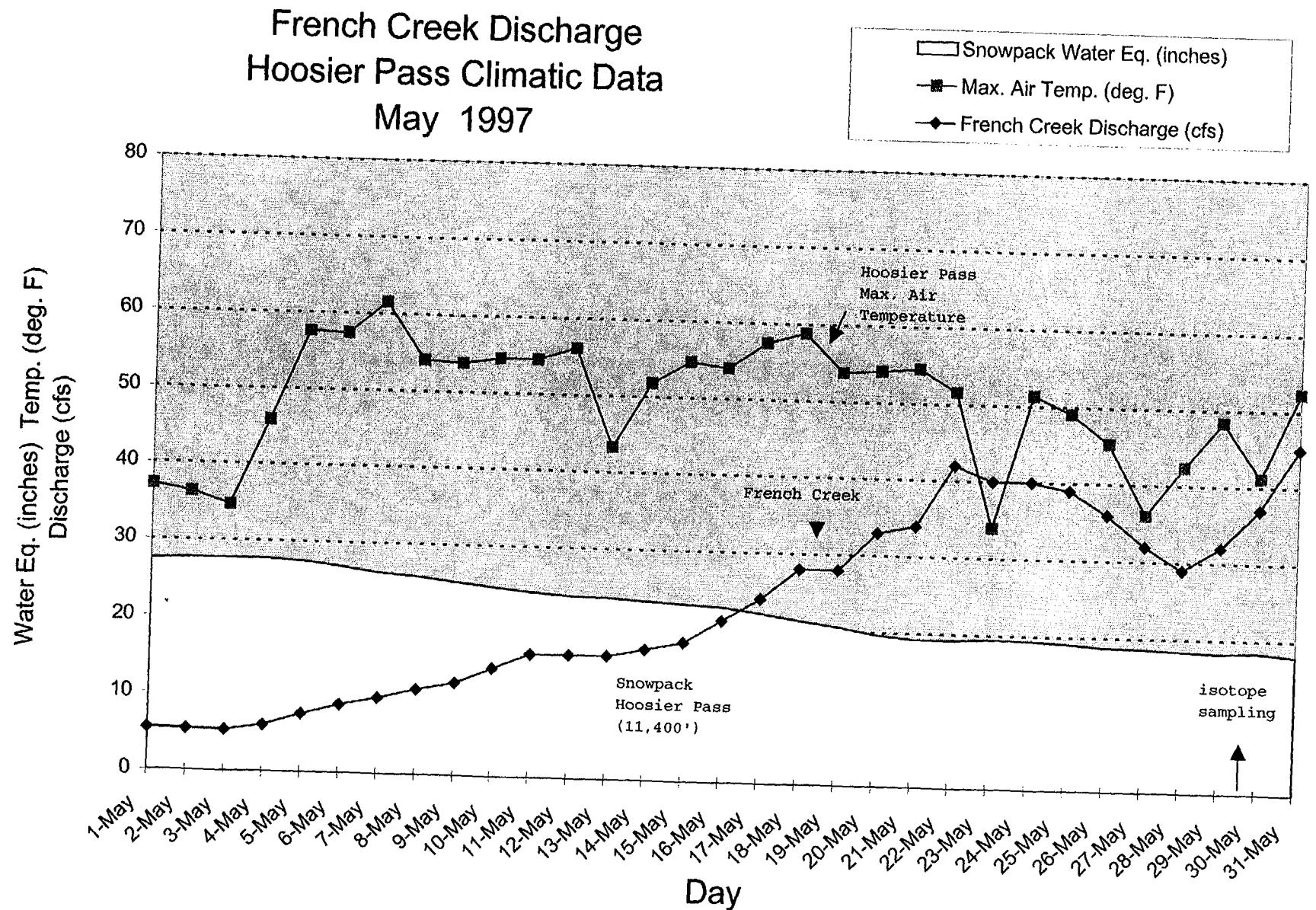


Figure 5-19

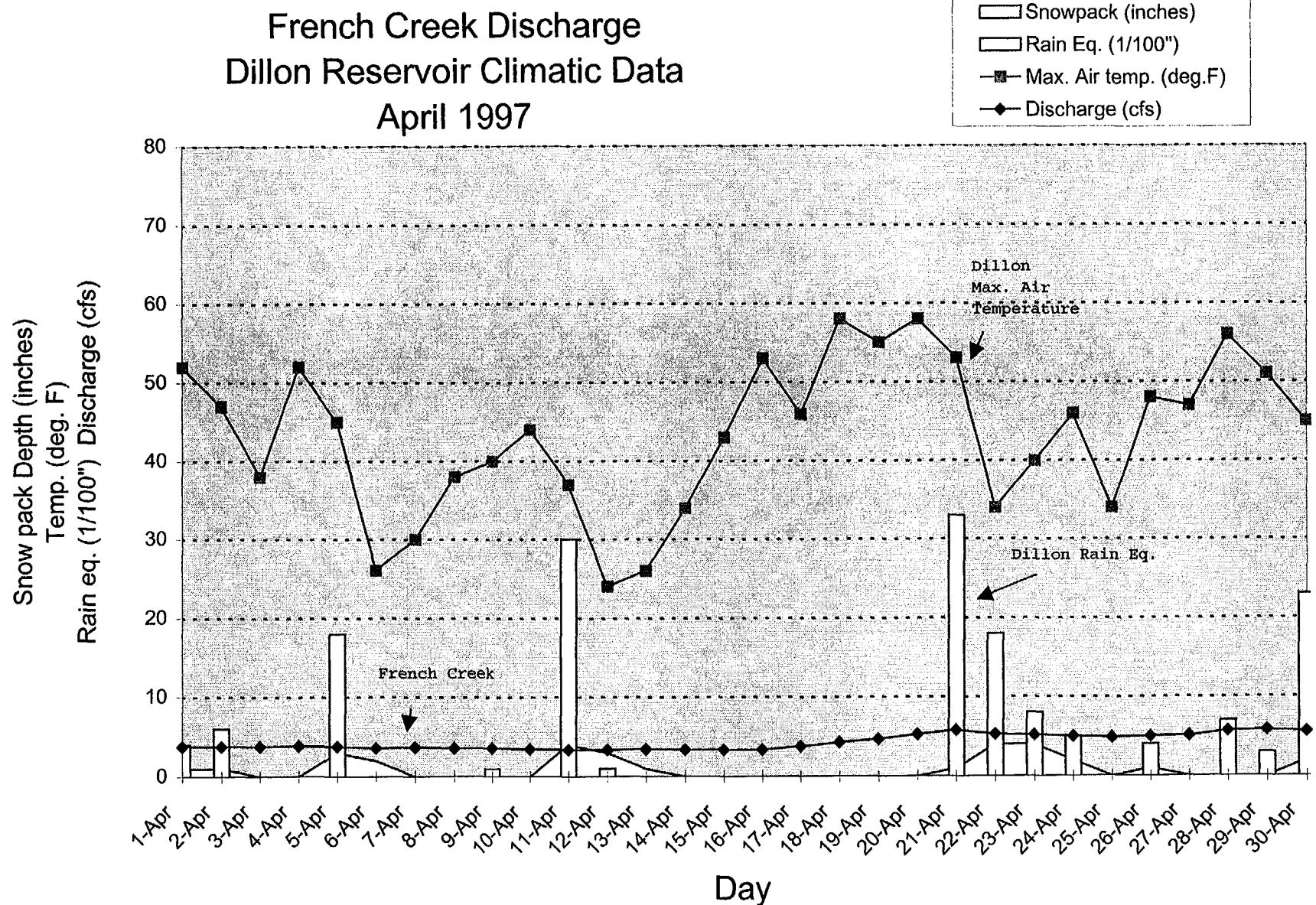


Figure 5-20

French Creek Discharge
Hoosier Pass Climatic Data
June 1997

Snowpack Water Eq. (inches)
French Creek Discharge (cfs)
Max. Air Temp. (deg.F)

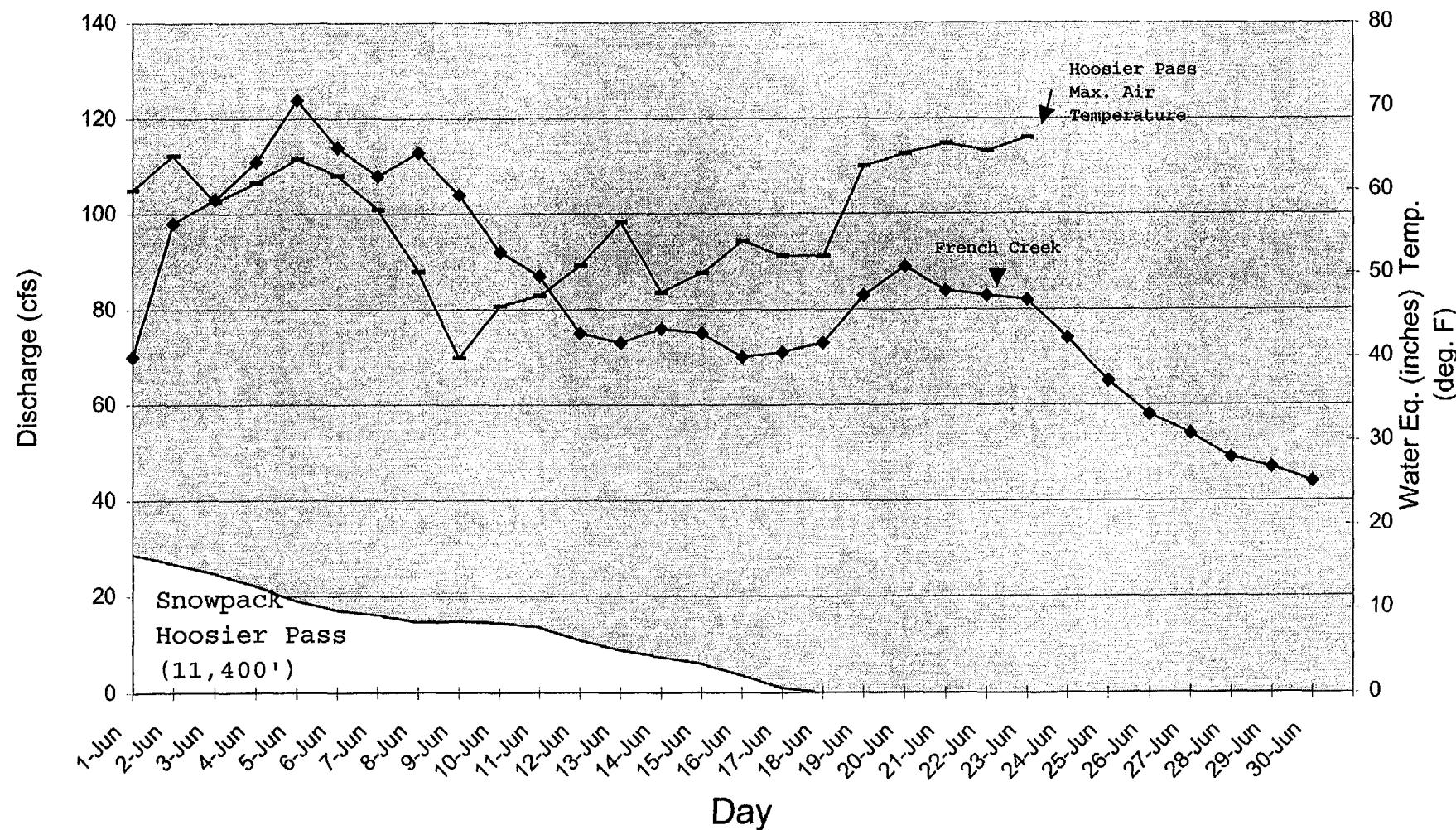


Figure 5-21

Phase III May 1997 High Flow
Stable Isotope Data - 5/29-30/97

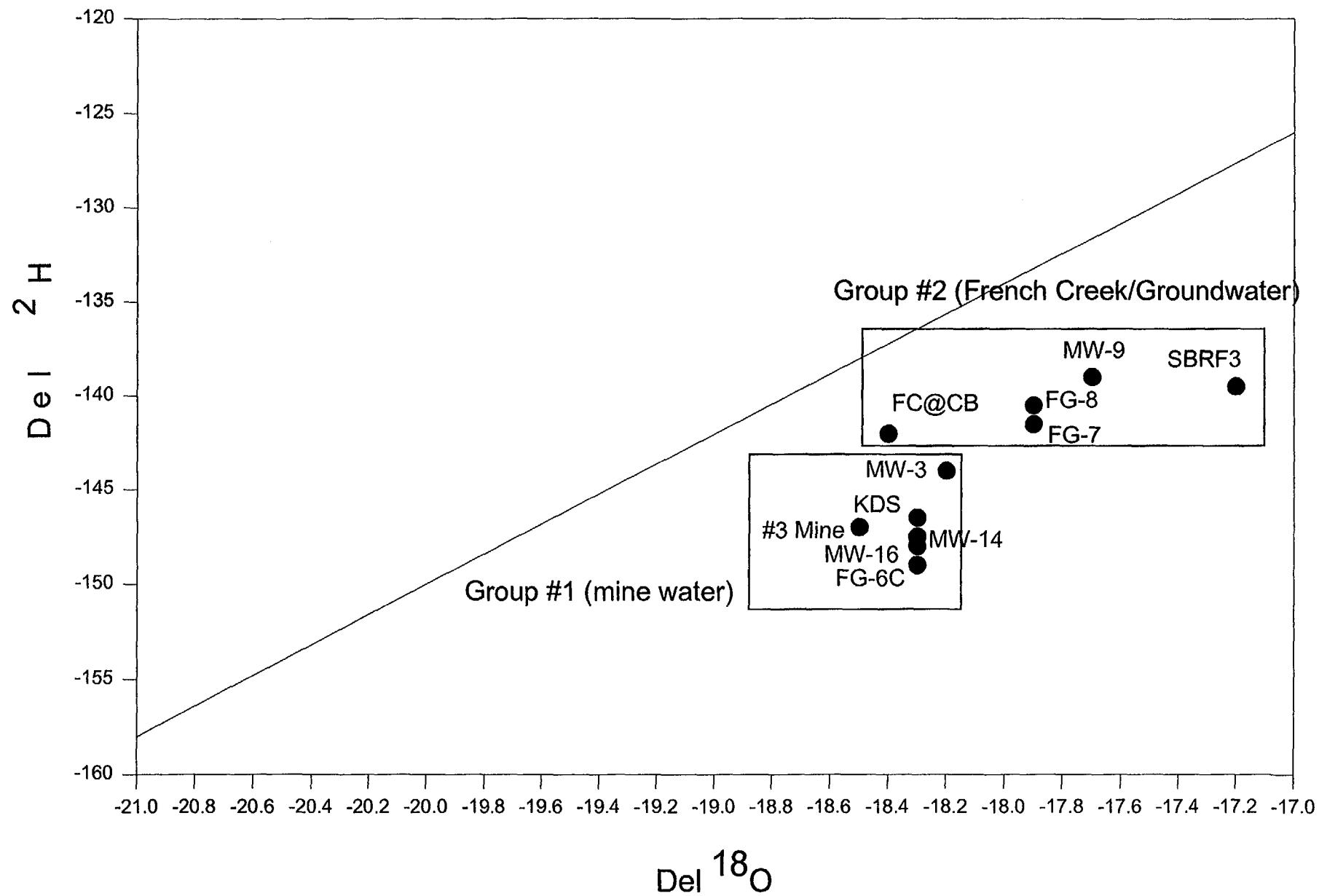


Figure 5-22

Phase III Stream Sampling Locations Stable Isotope Data

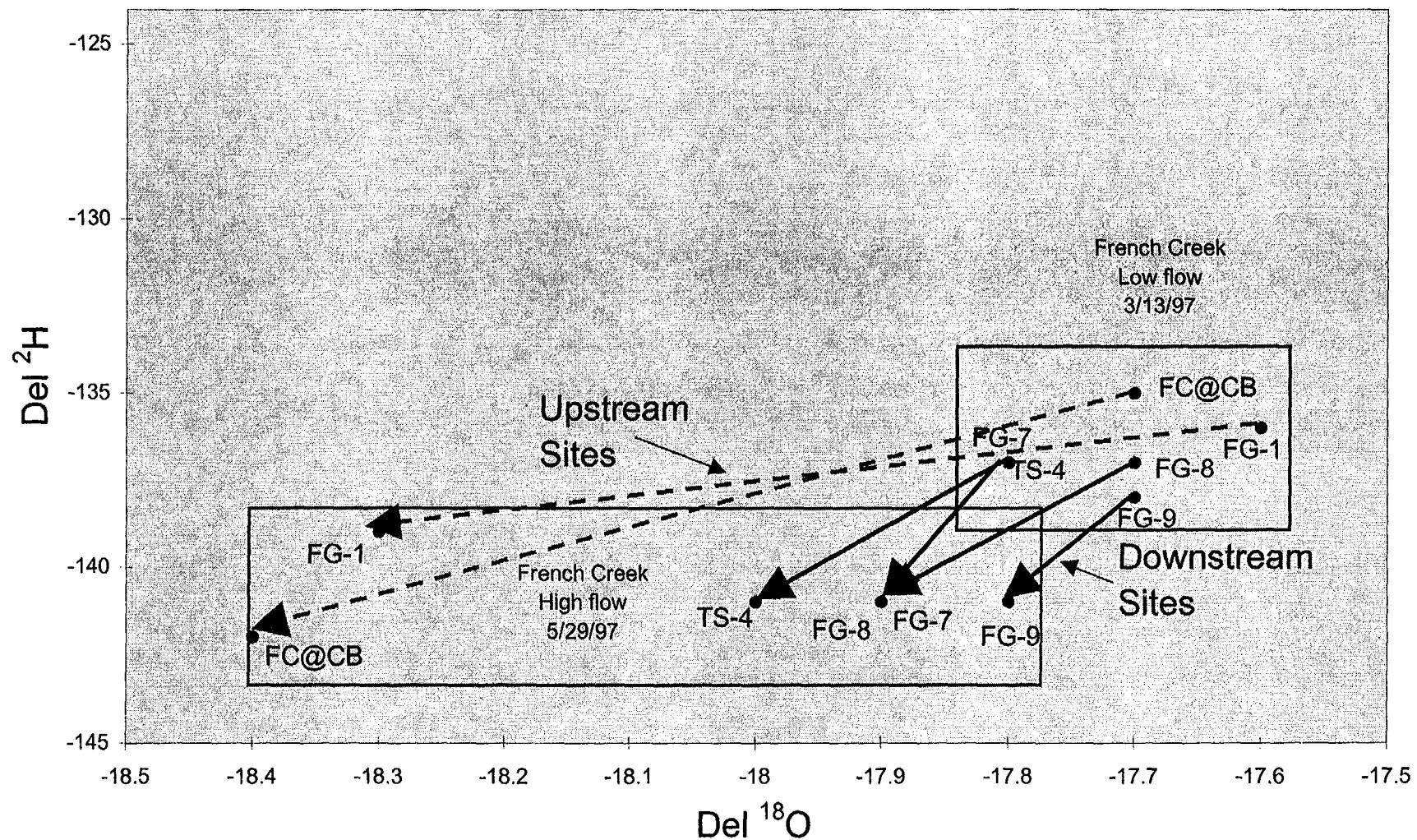


Figure 5-23

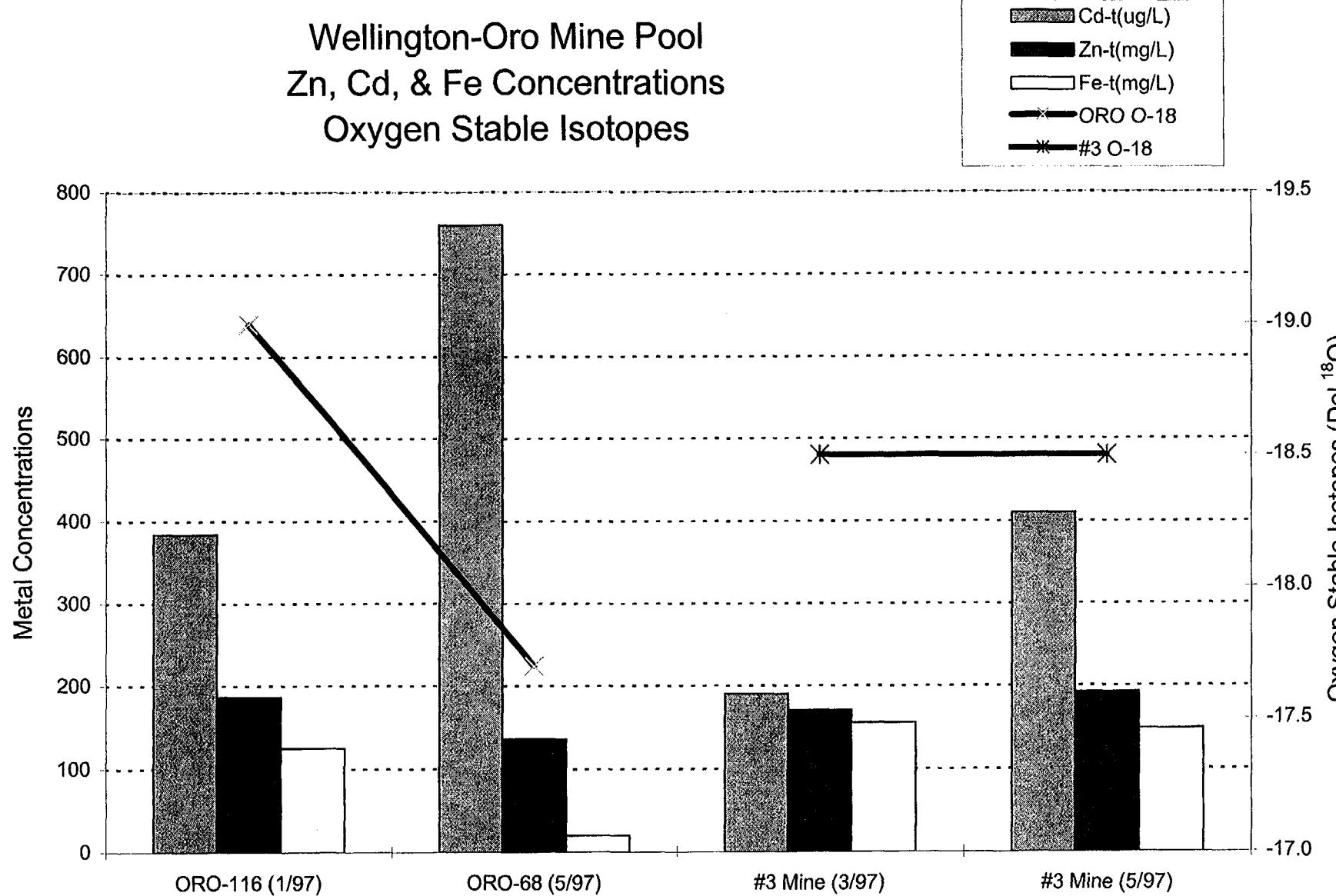


Figure 5-24

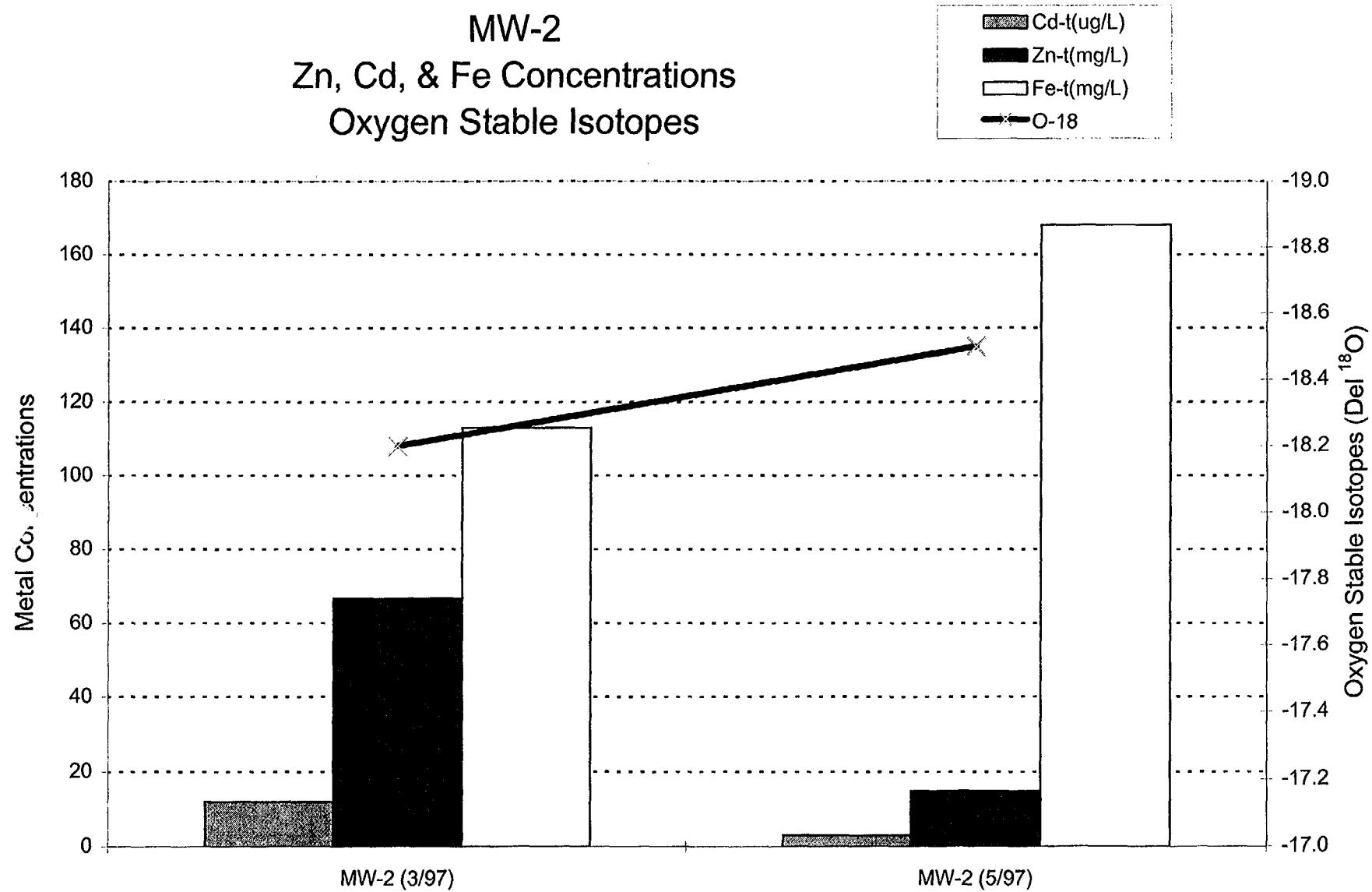


Figure 5-25

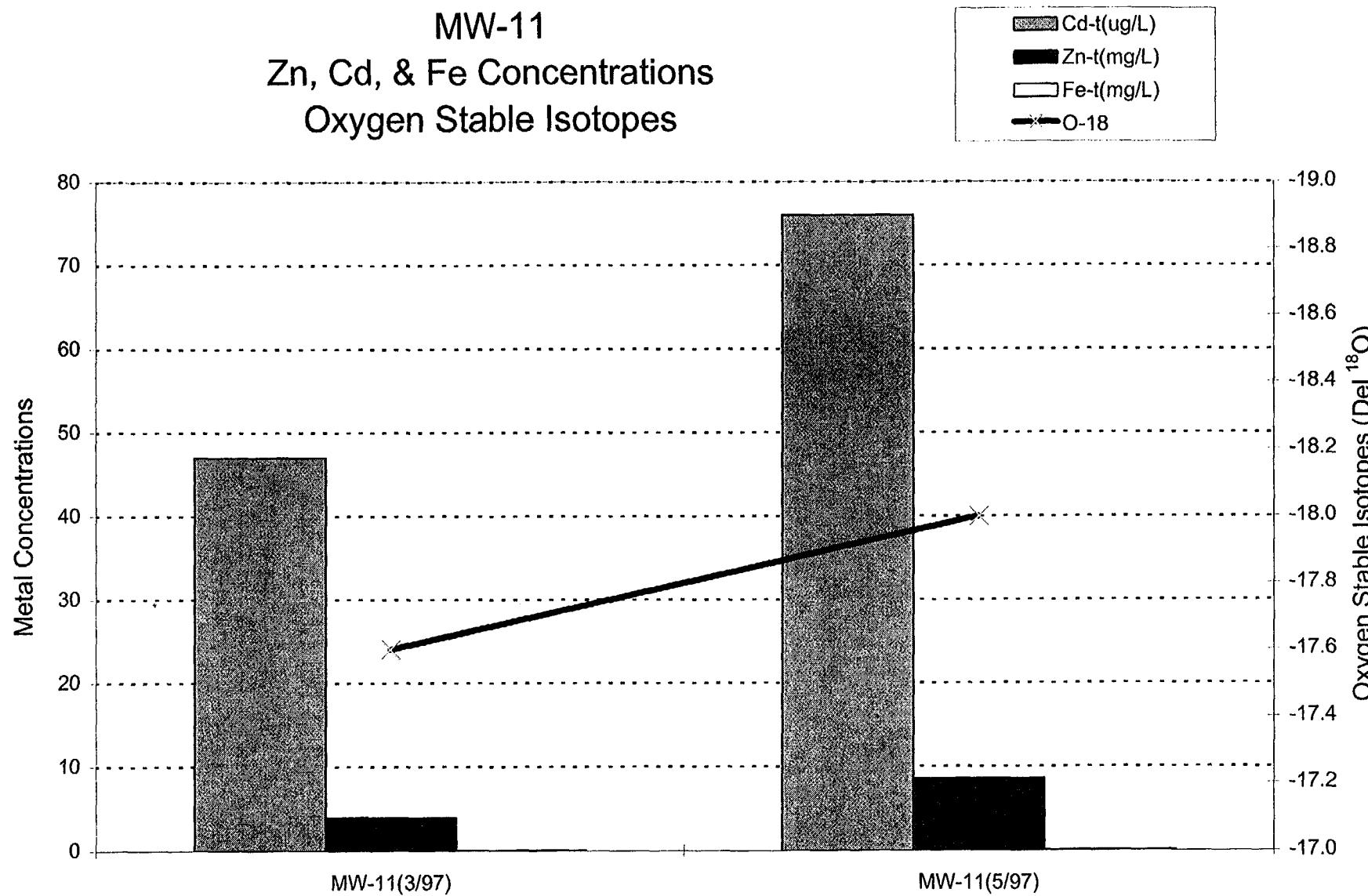


Figure 5-26

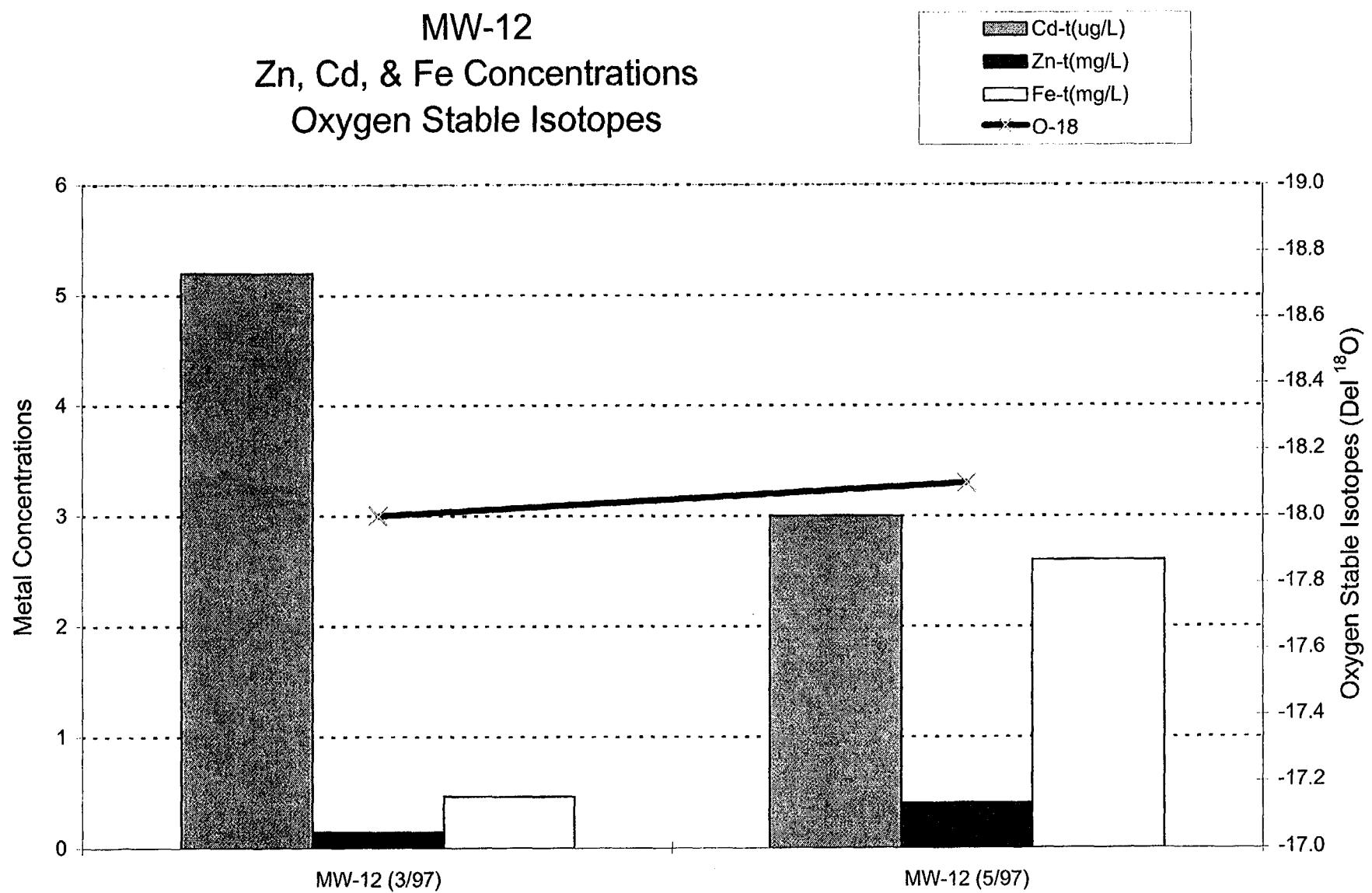


Figure 5-27

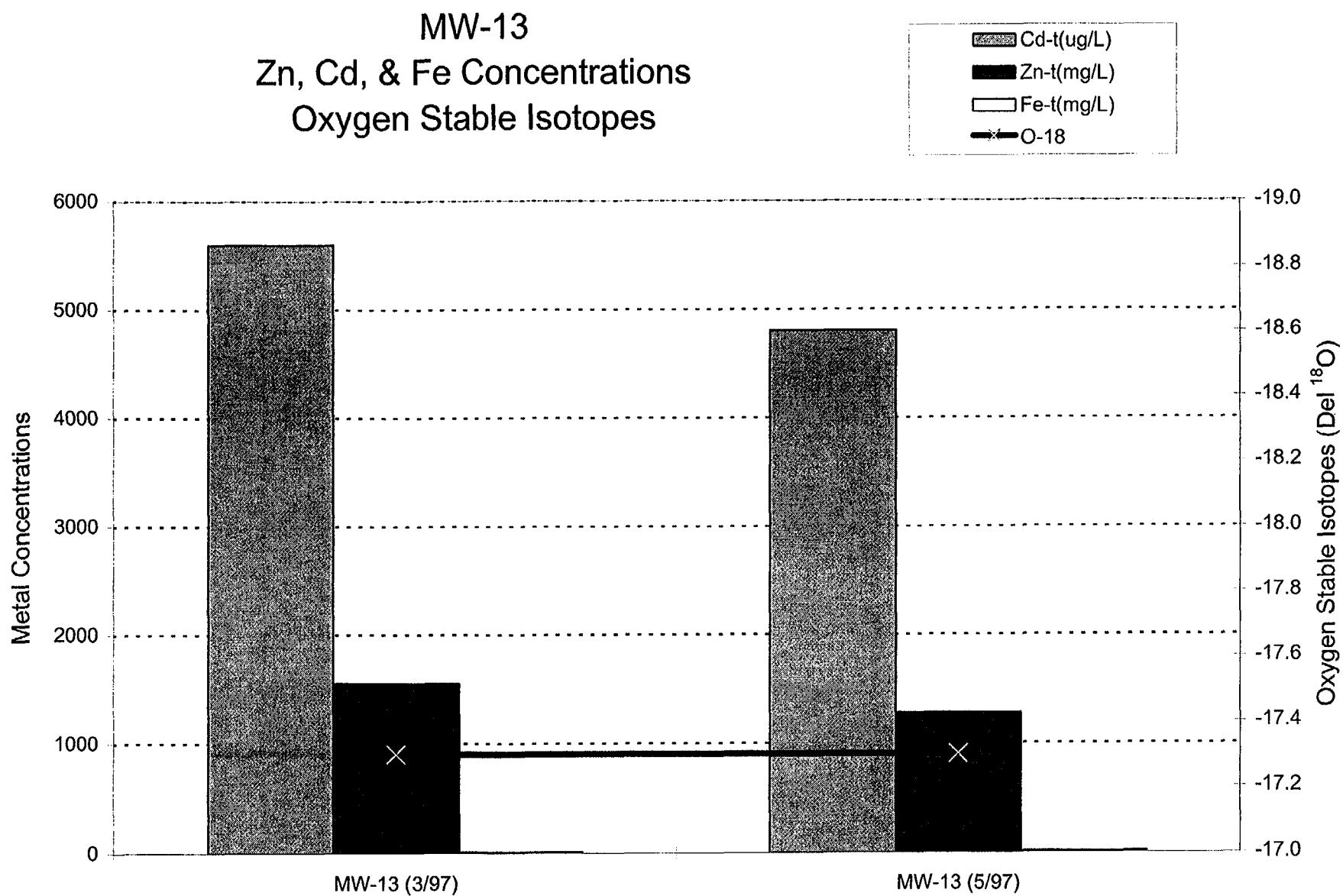


Figure 5-28

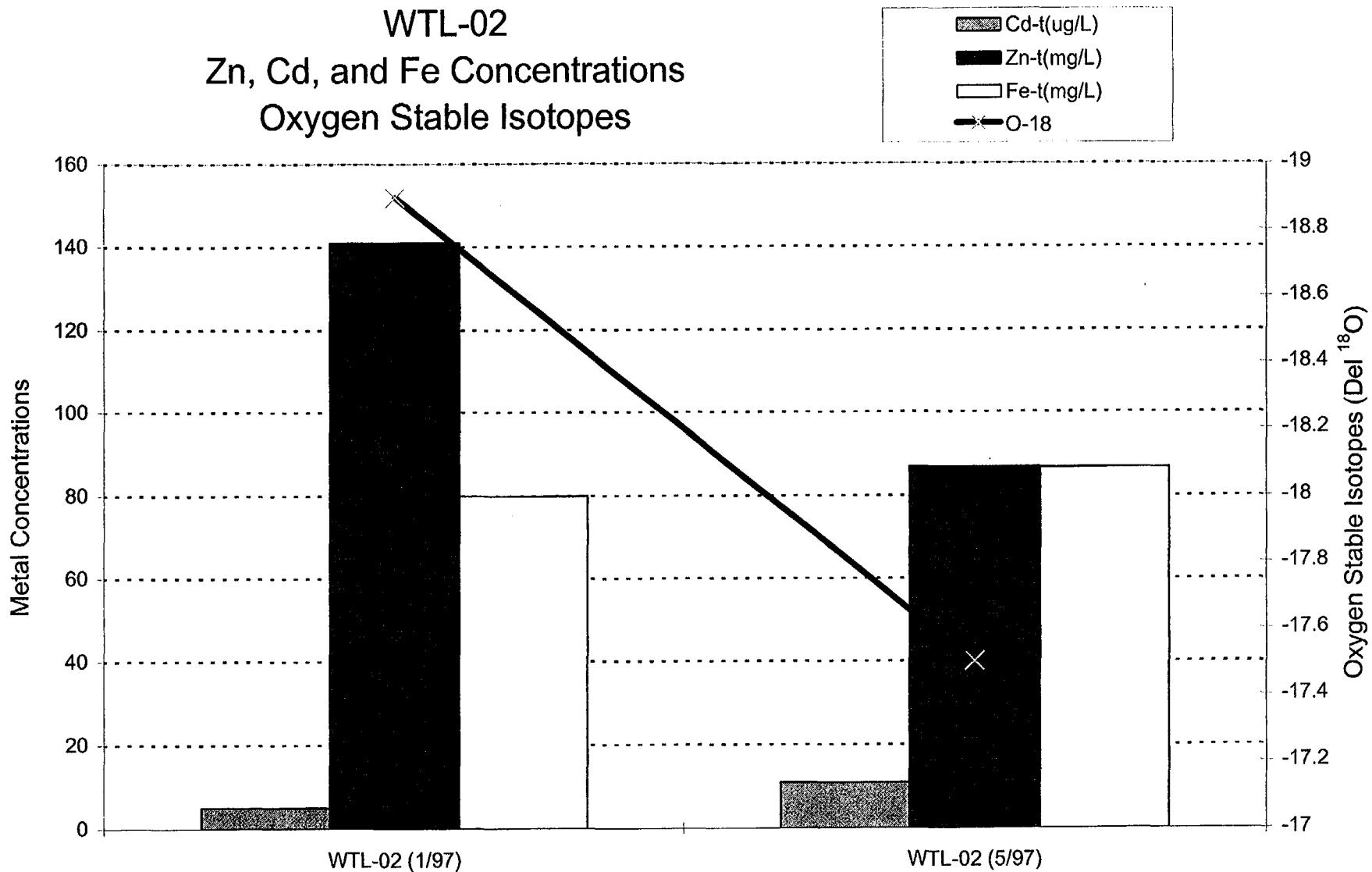


Figure 5-29

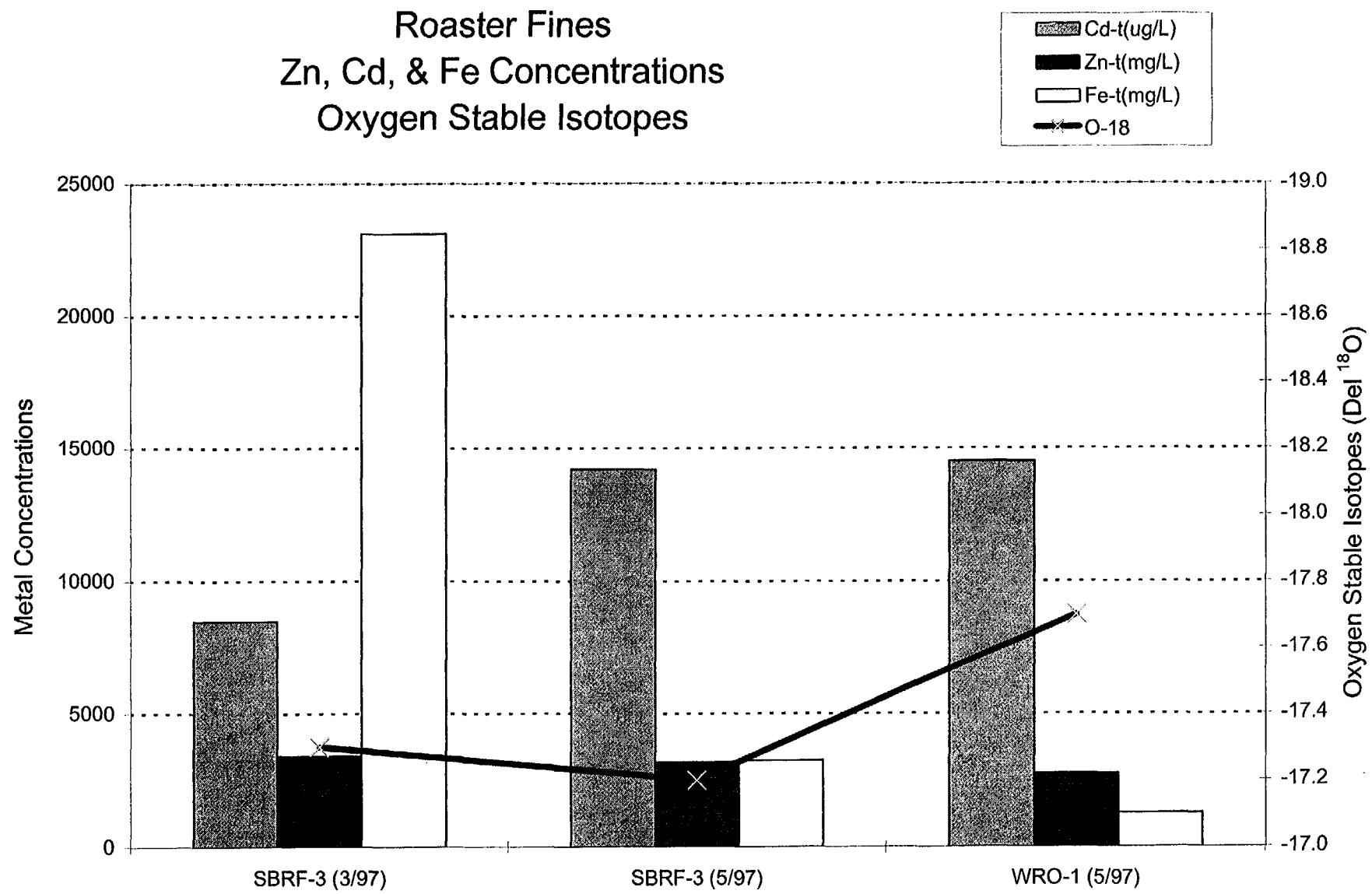


Figure 5-30

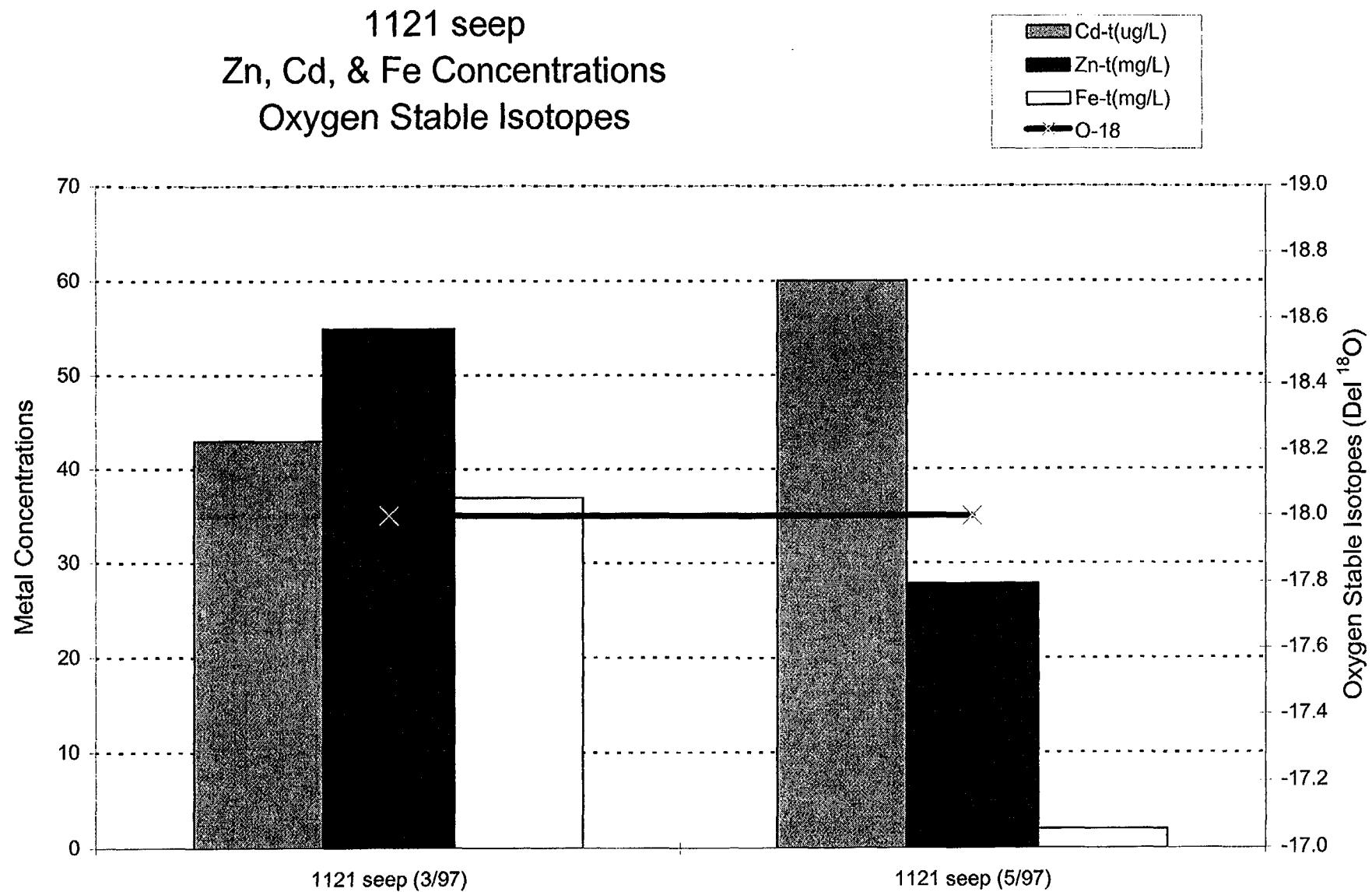


Figure 5-31

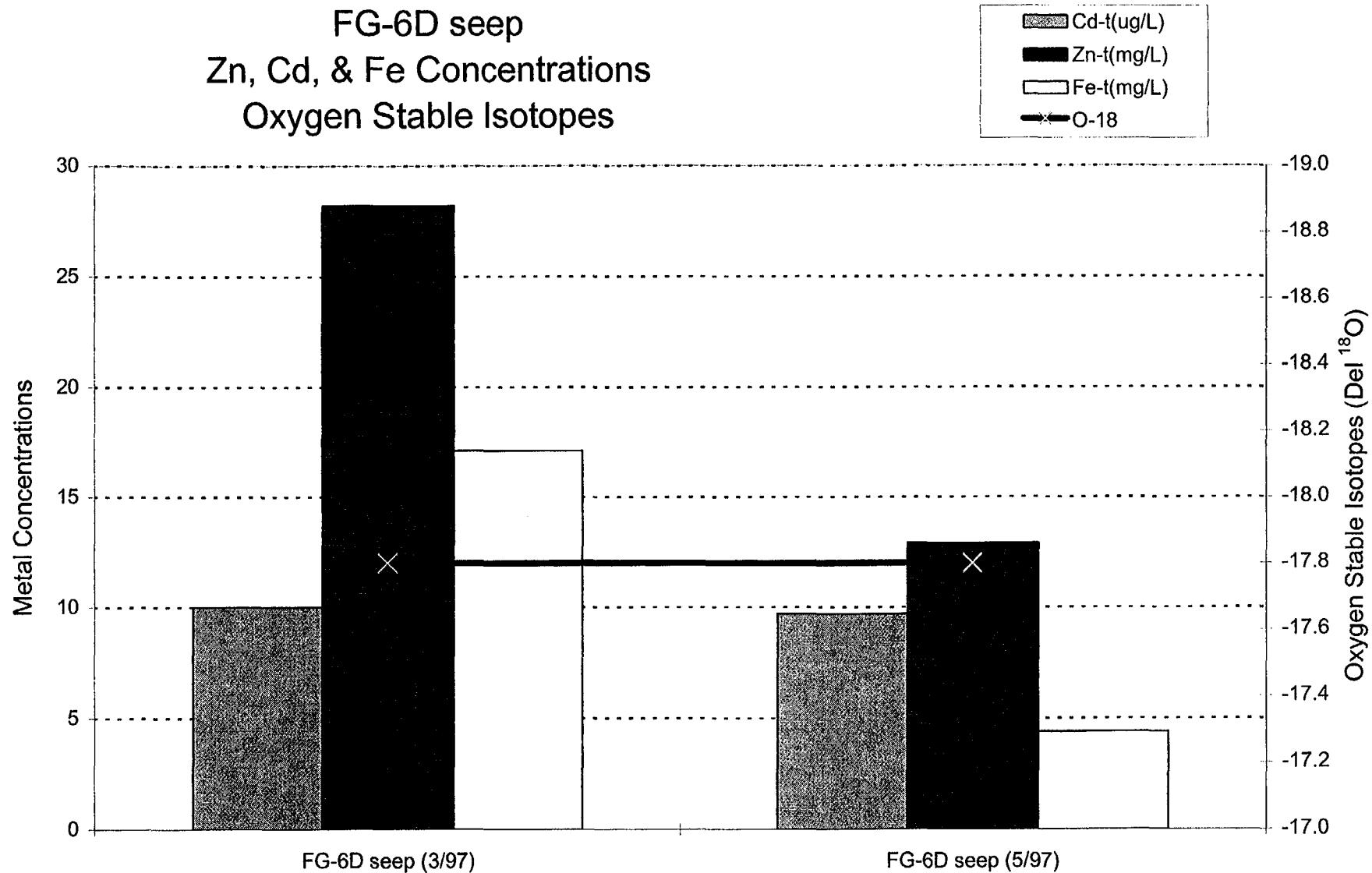


Figure 5-32

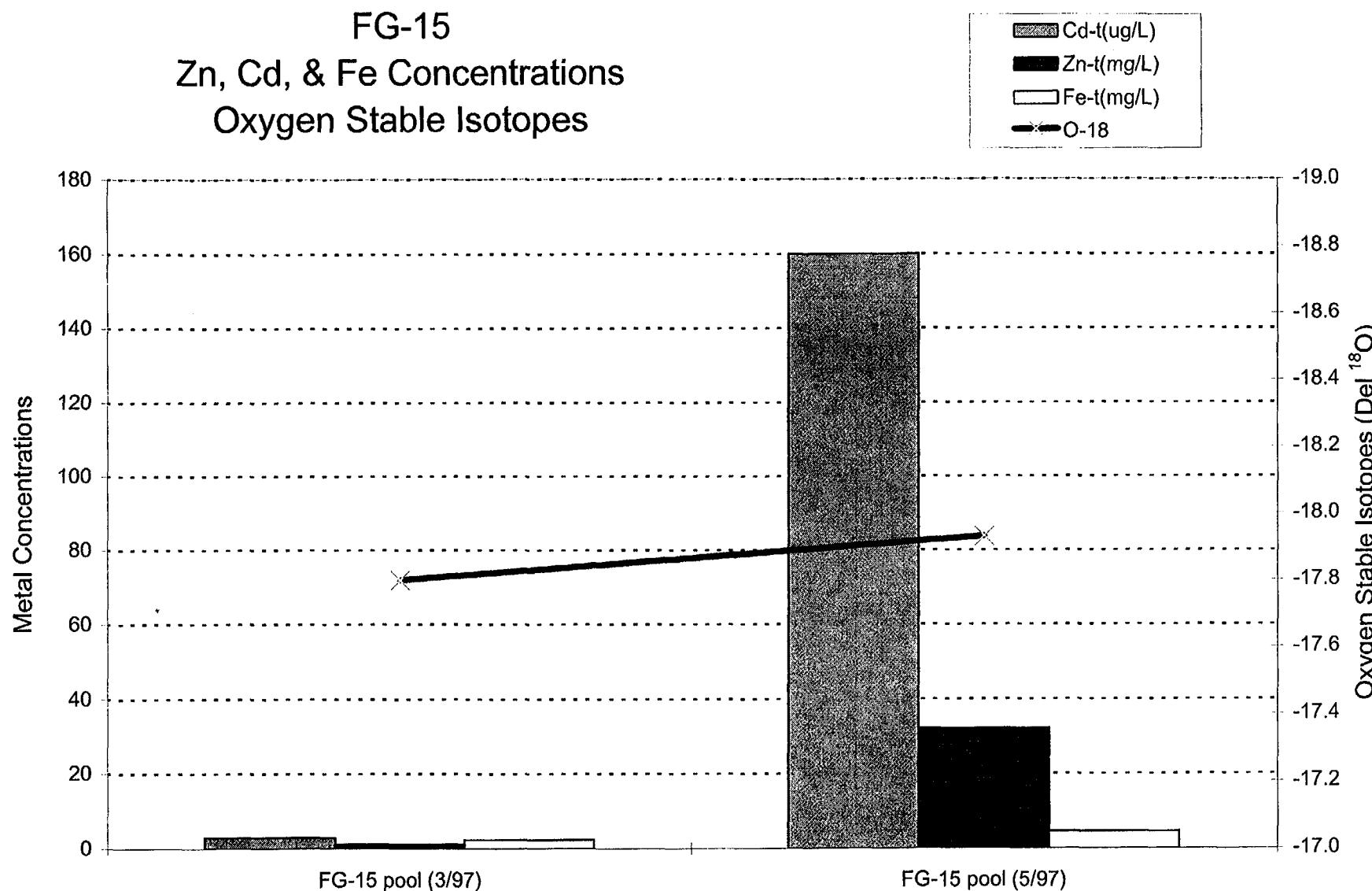


Figure 5-33

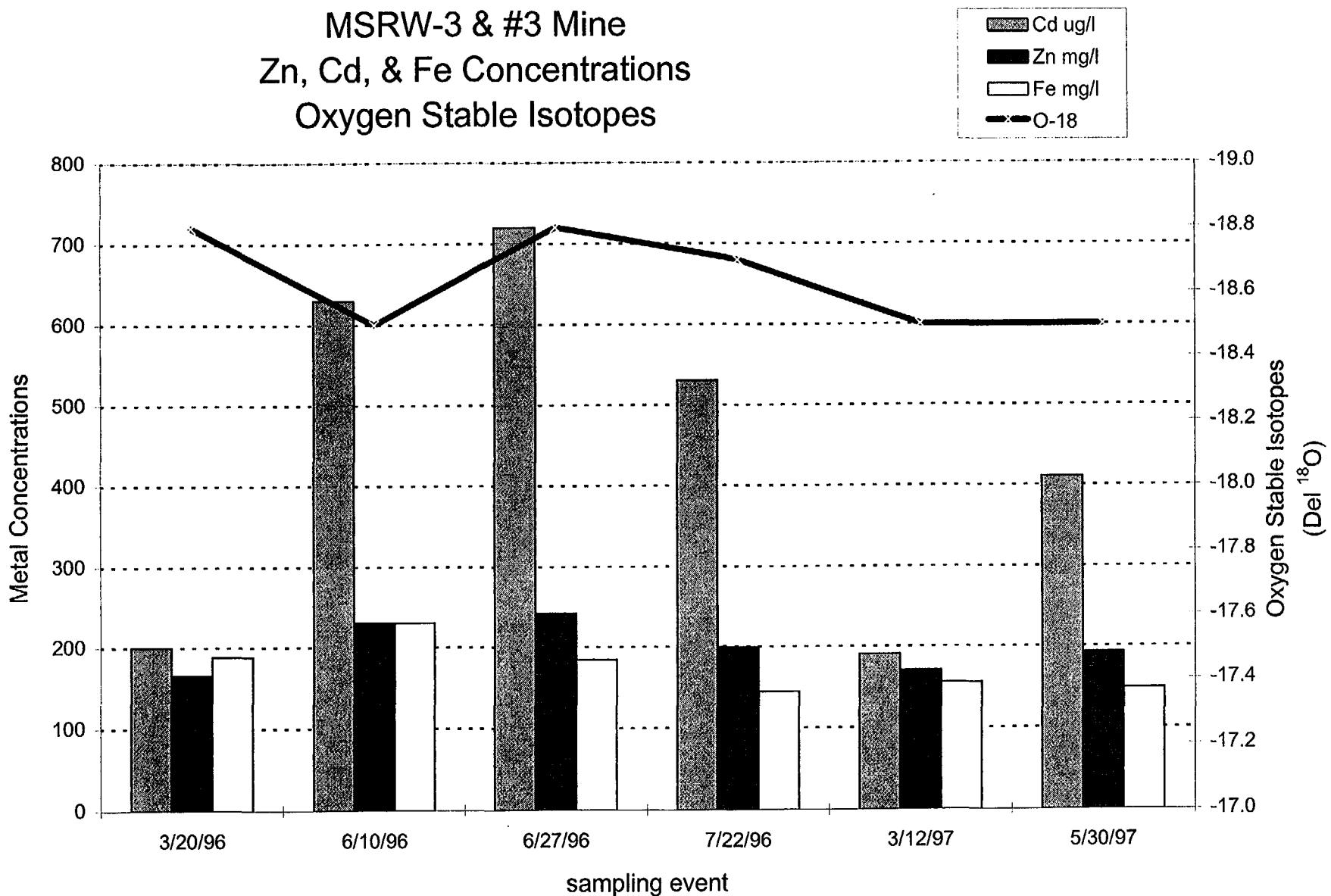


Figure 5-34

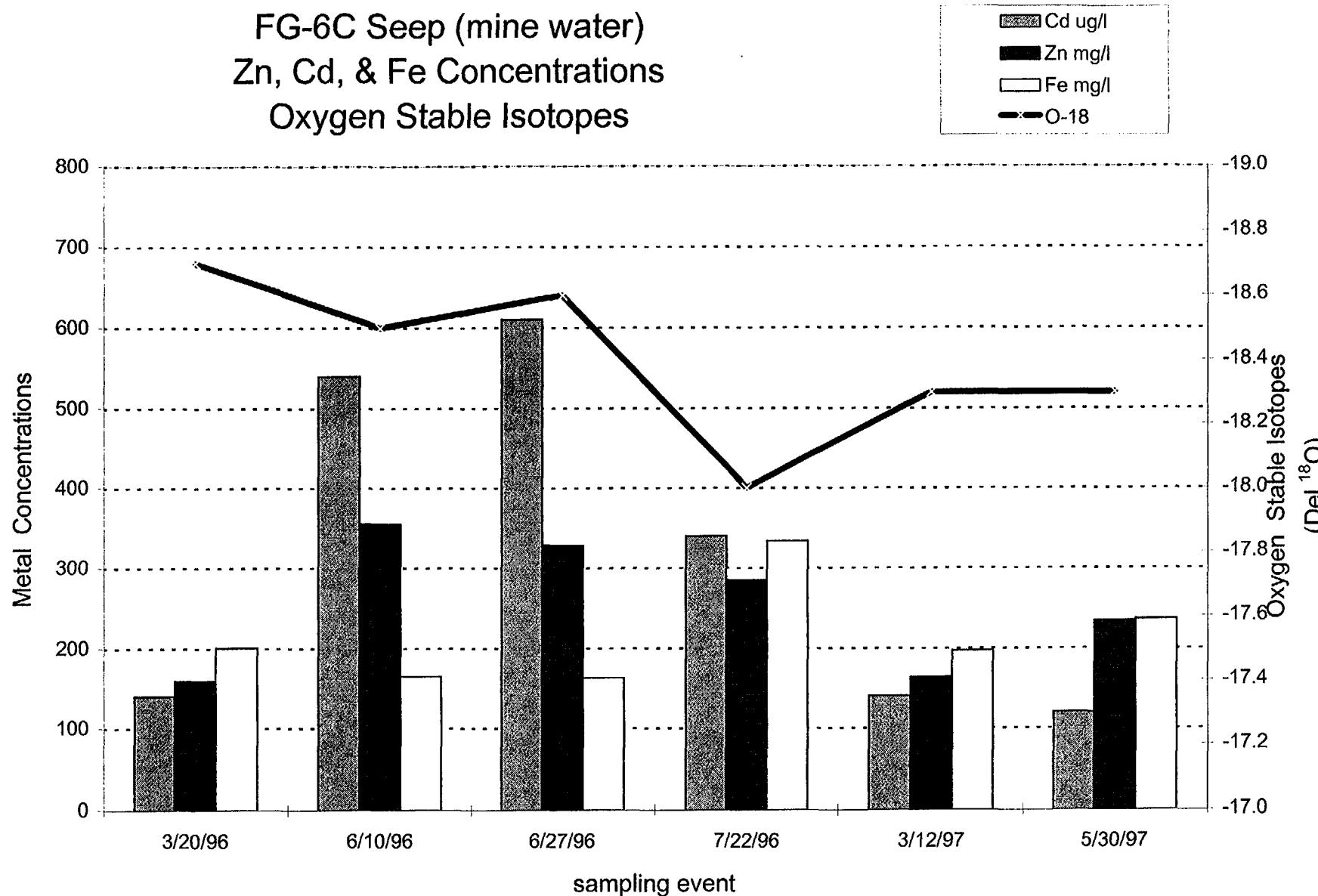


Figure 5-35

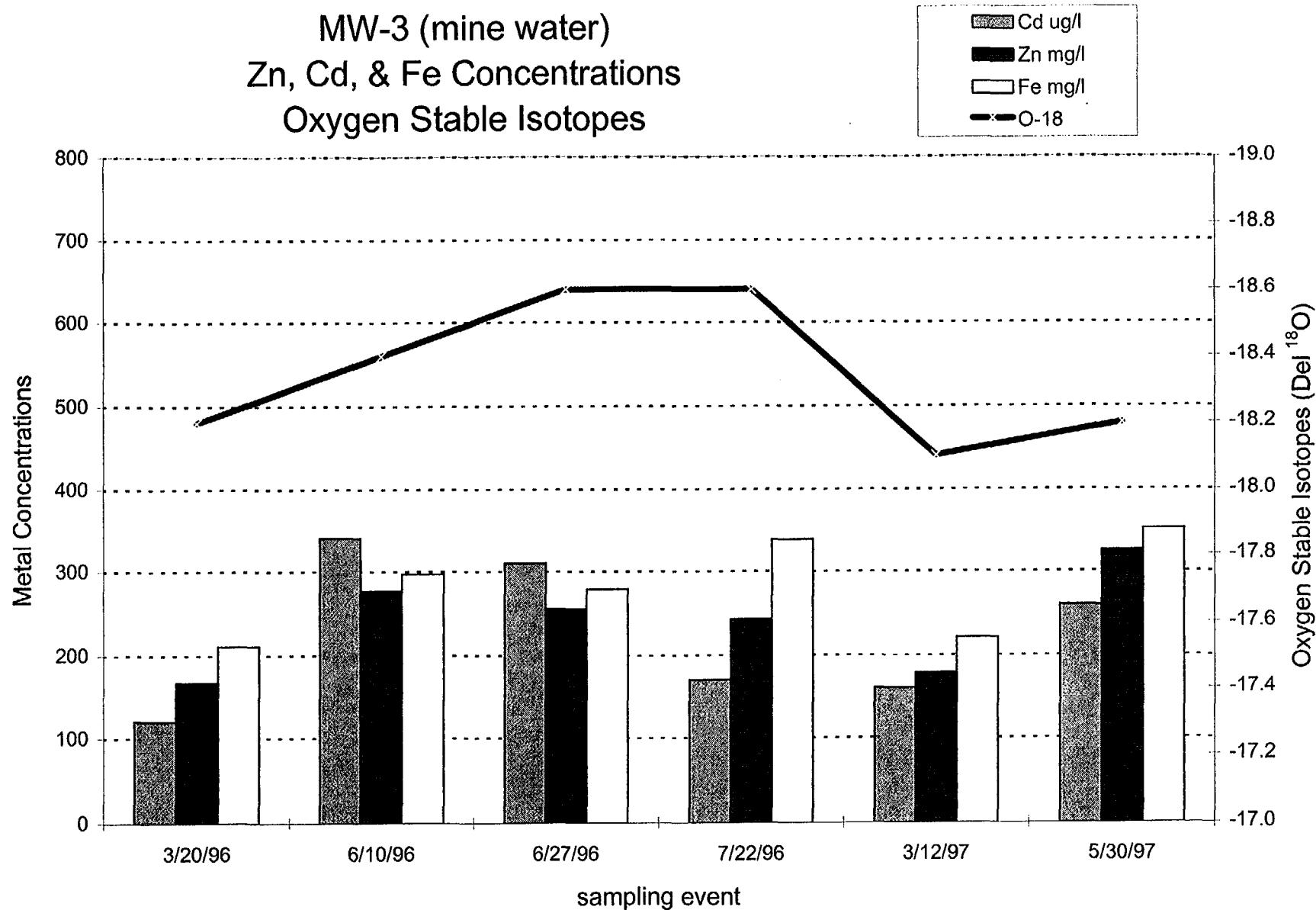


Figure 5-36

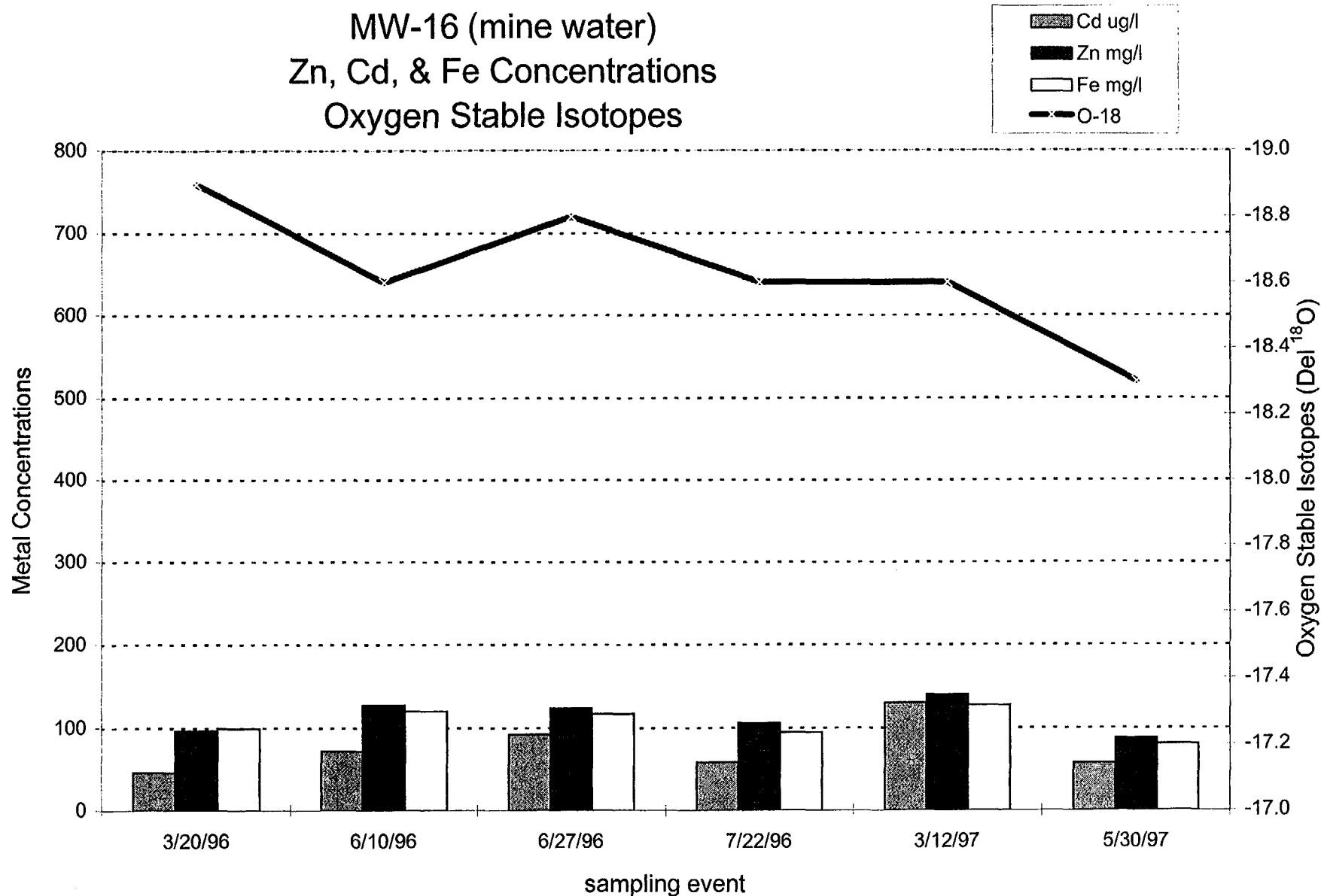


Figure 5-37

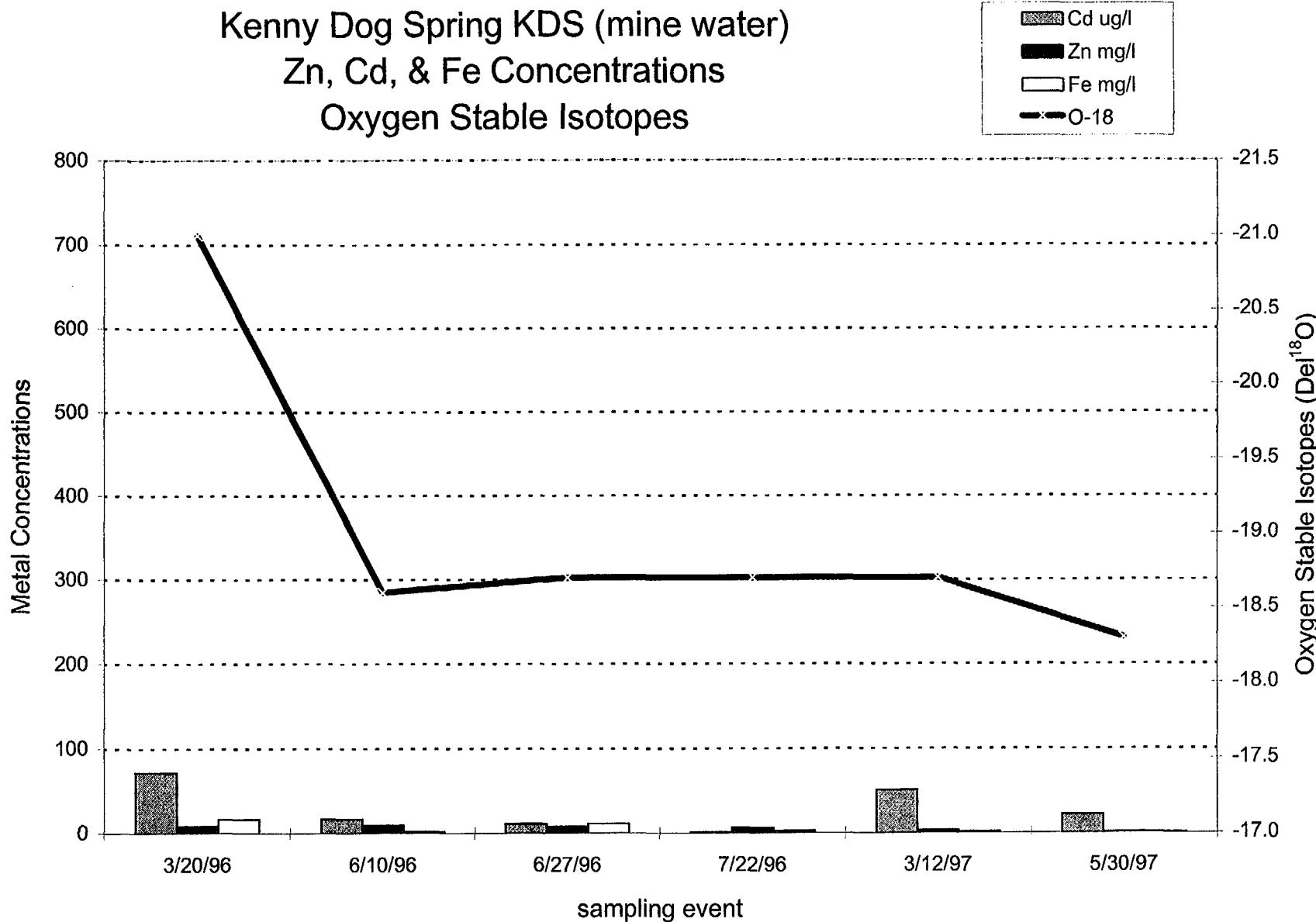


Figure 5-38

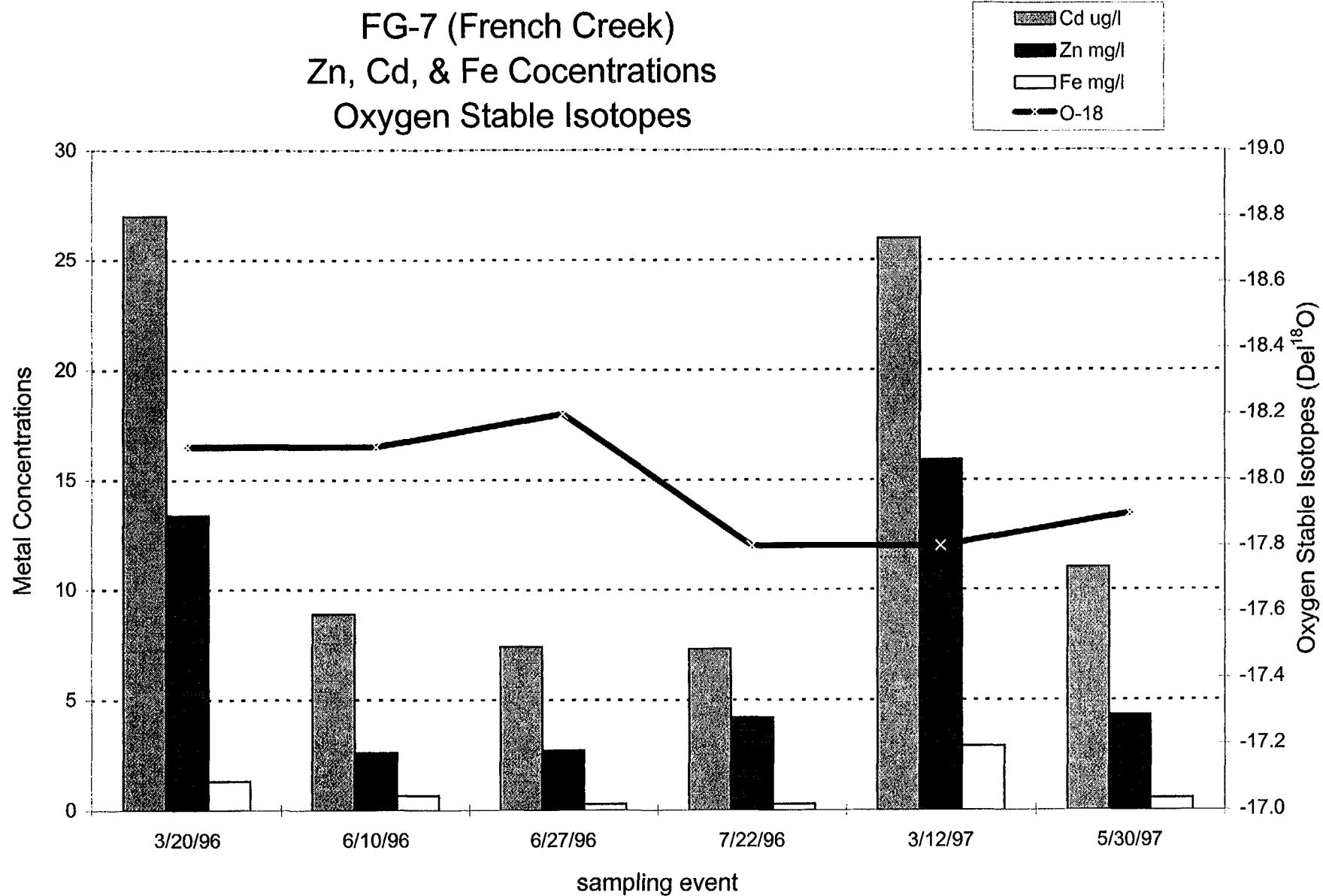


Figure 5-39

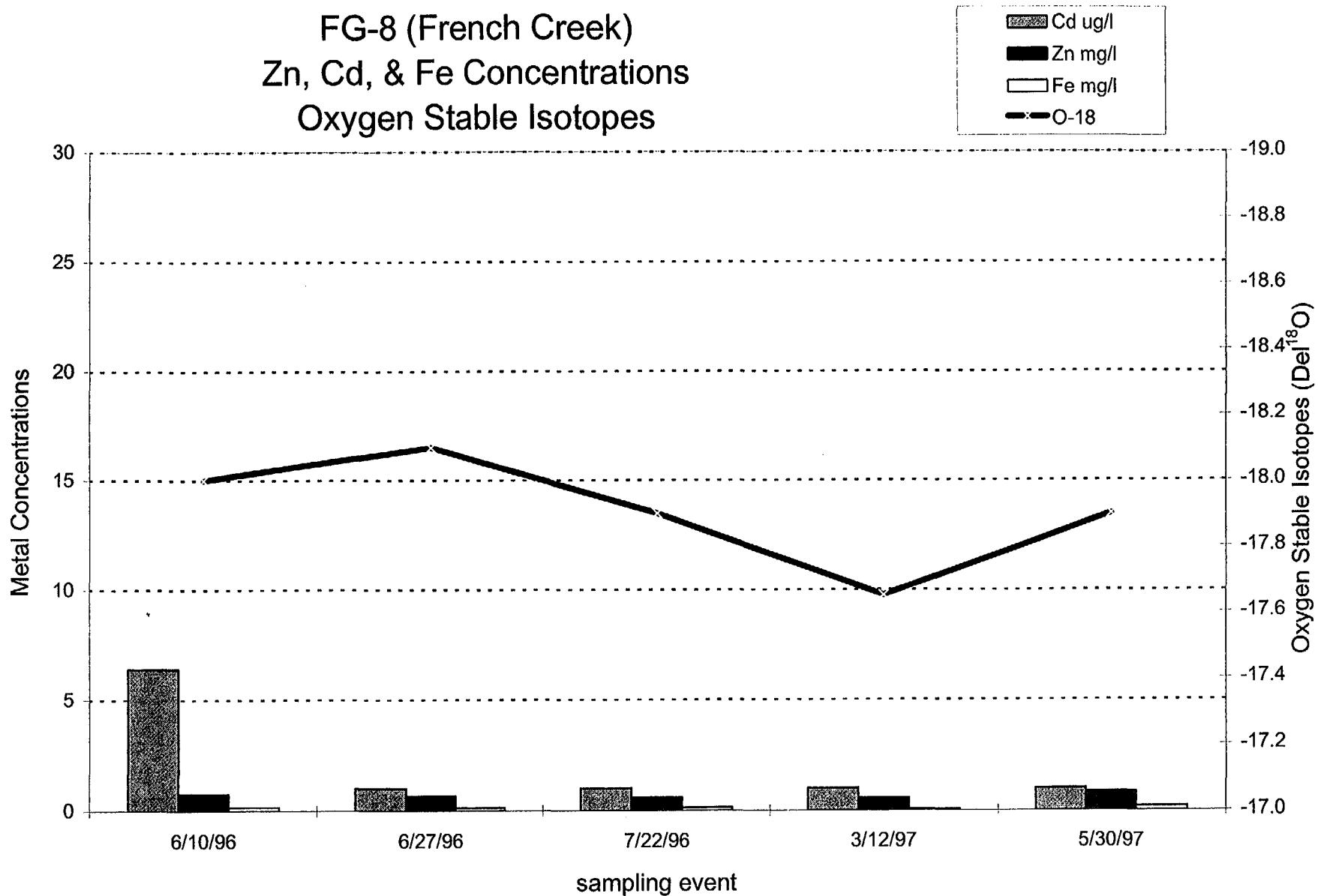


Figure 5-40

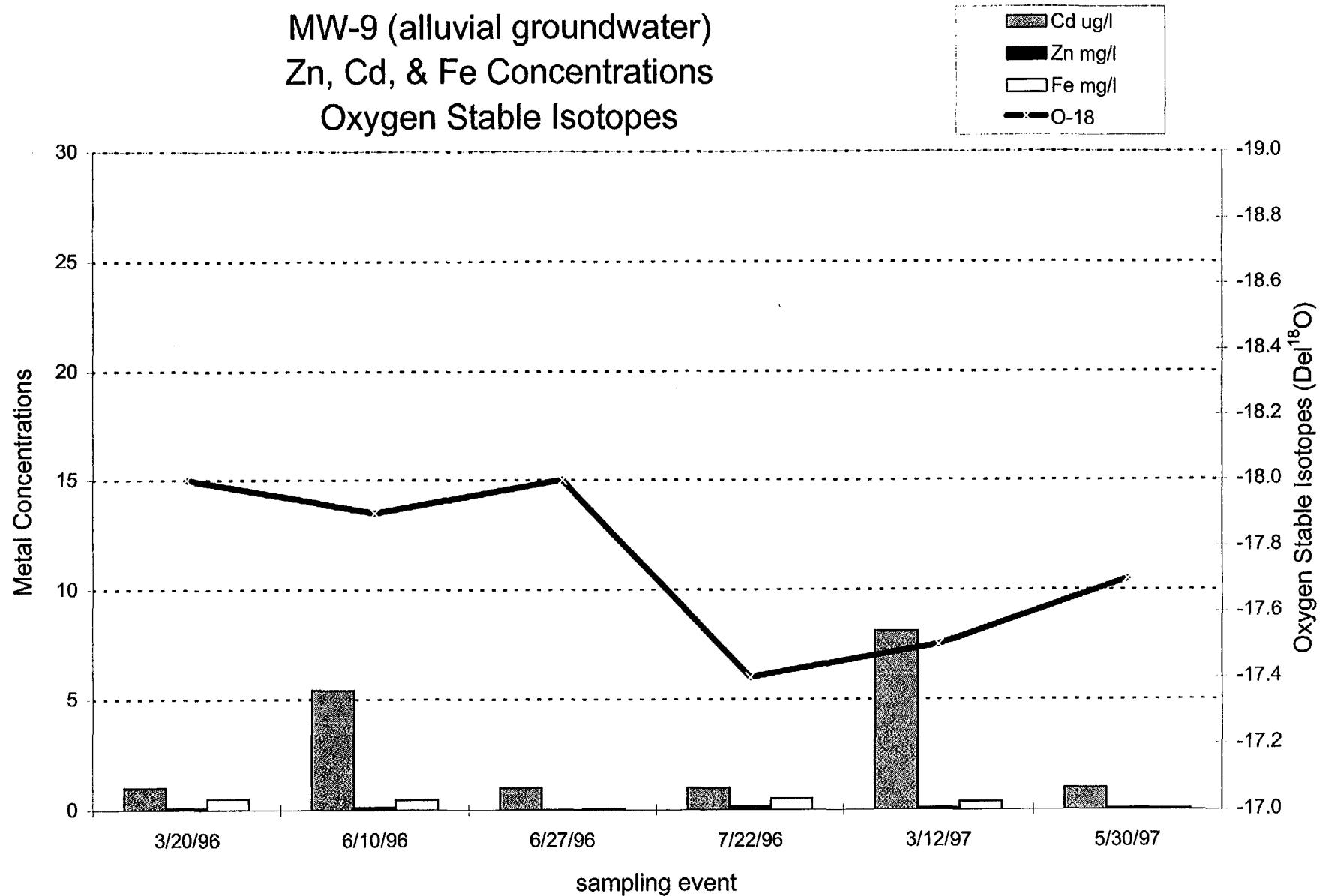


Figure 5-41

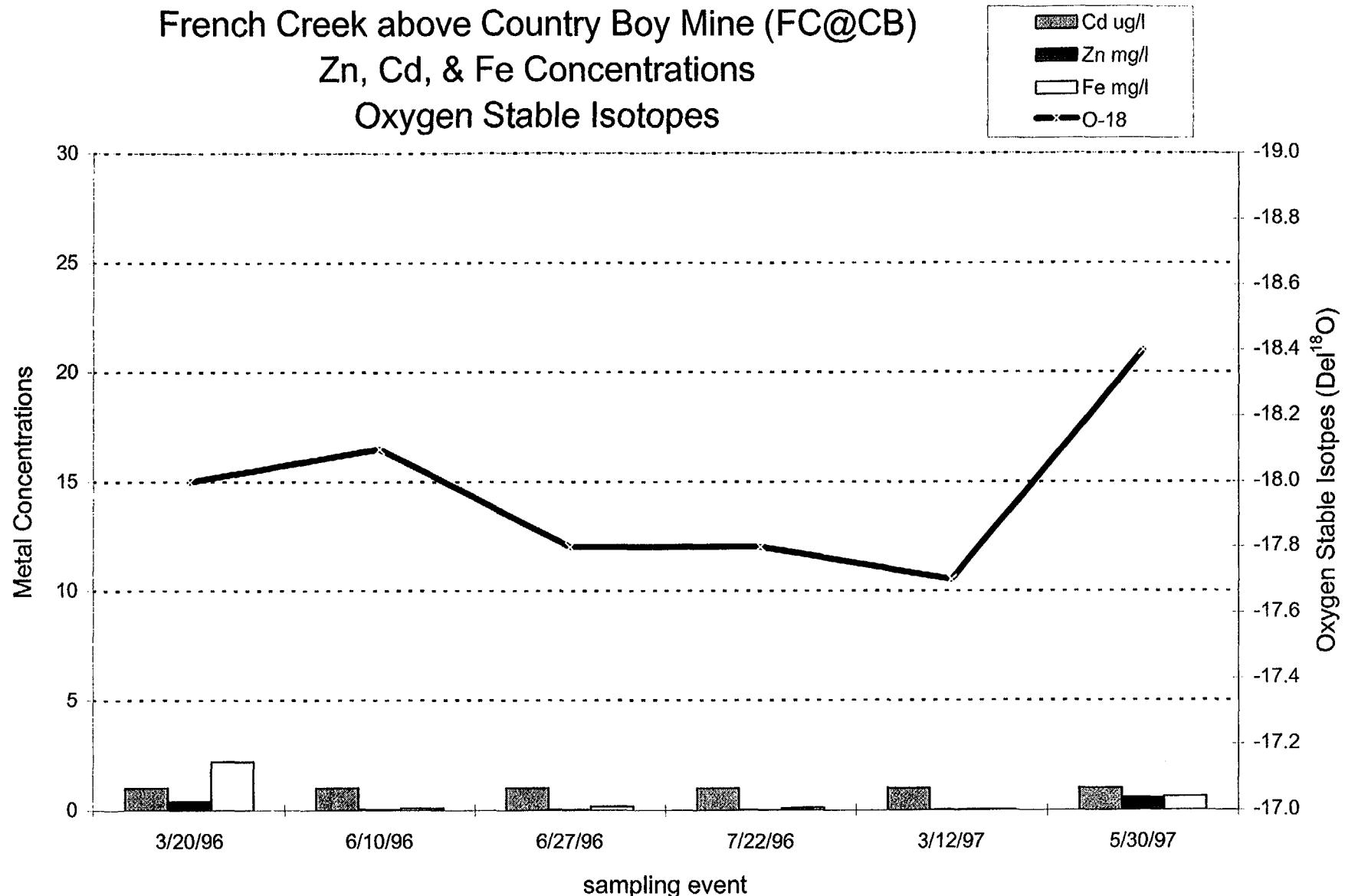


Figure 5-42

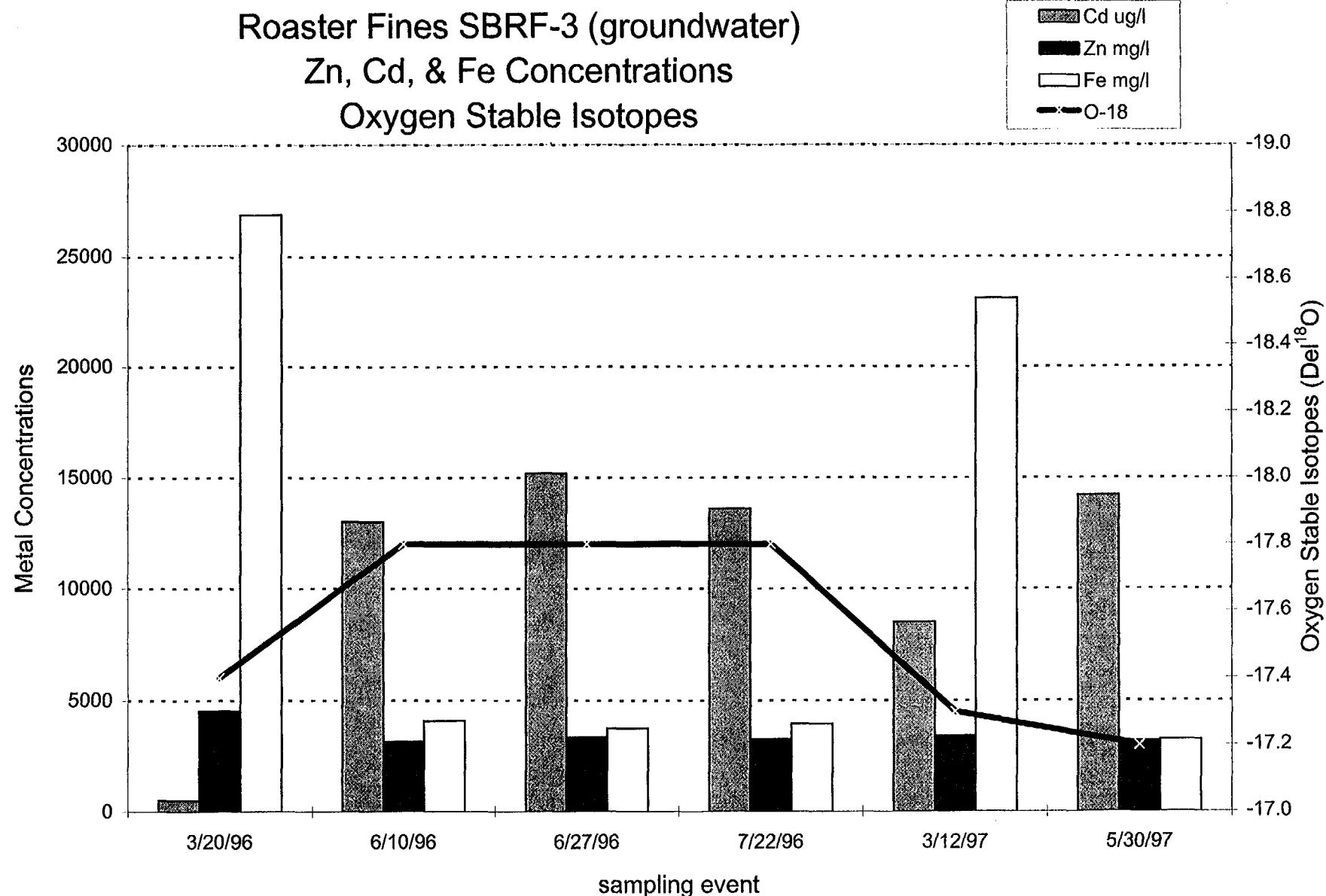


Figure 5-43

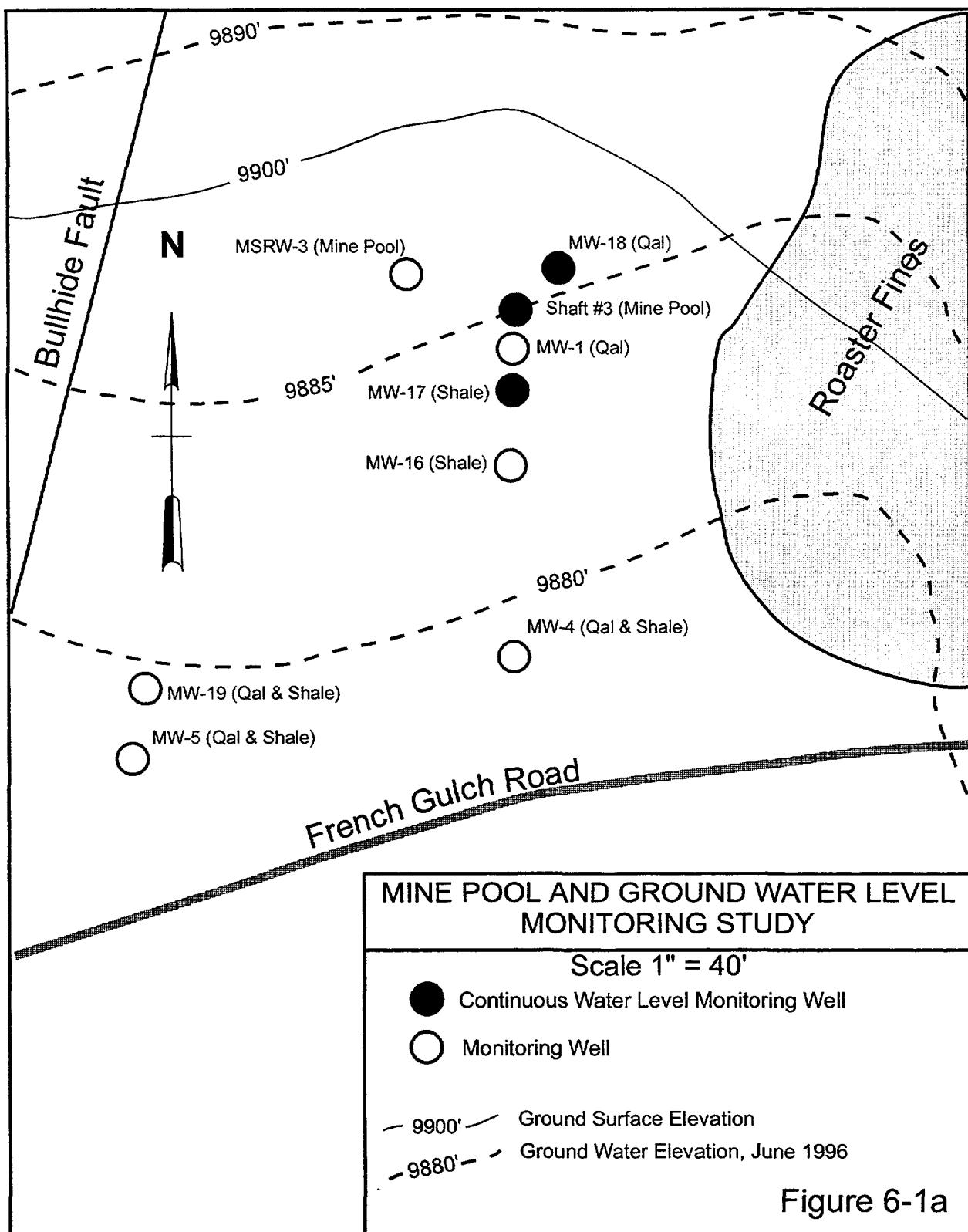
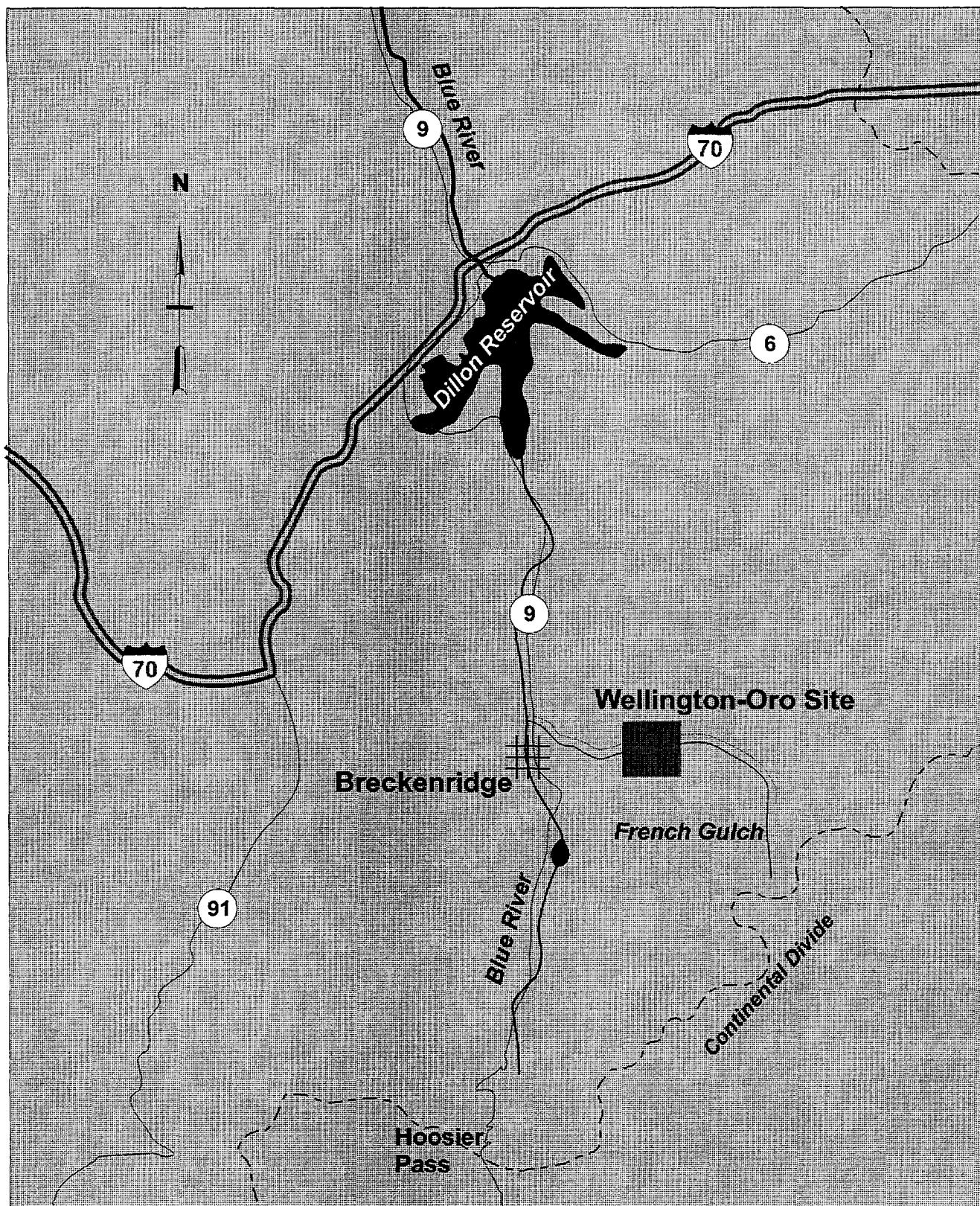


Figure 6-1a



Location Map

0 Kilometers 8

0 Miles 5

Figure 6-1b

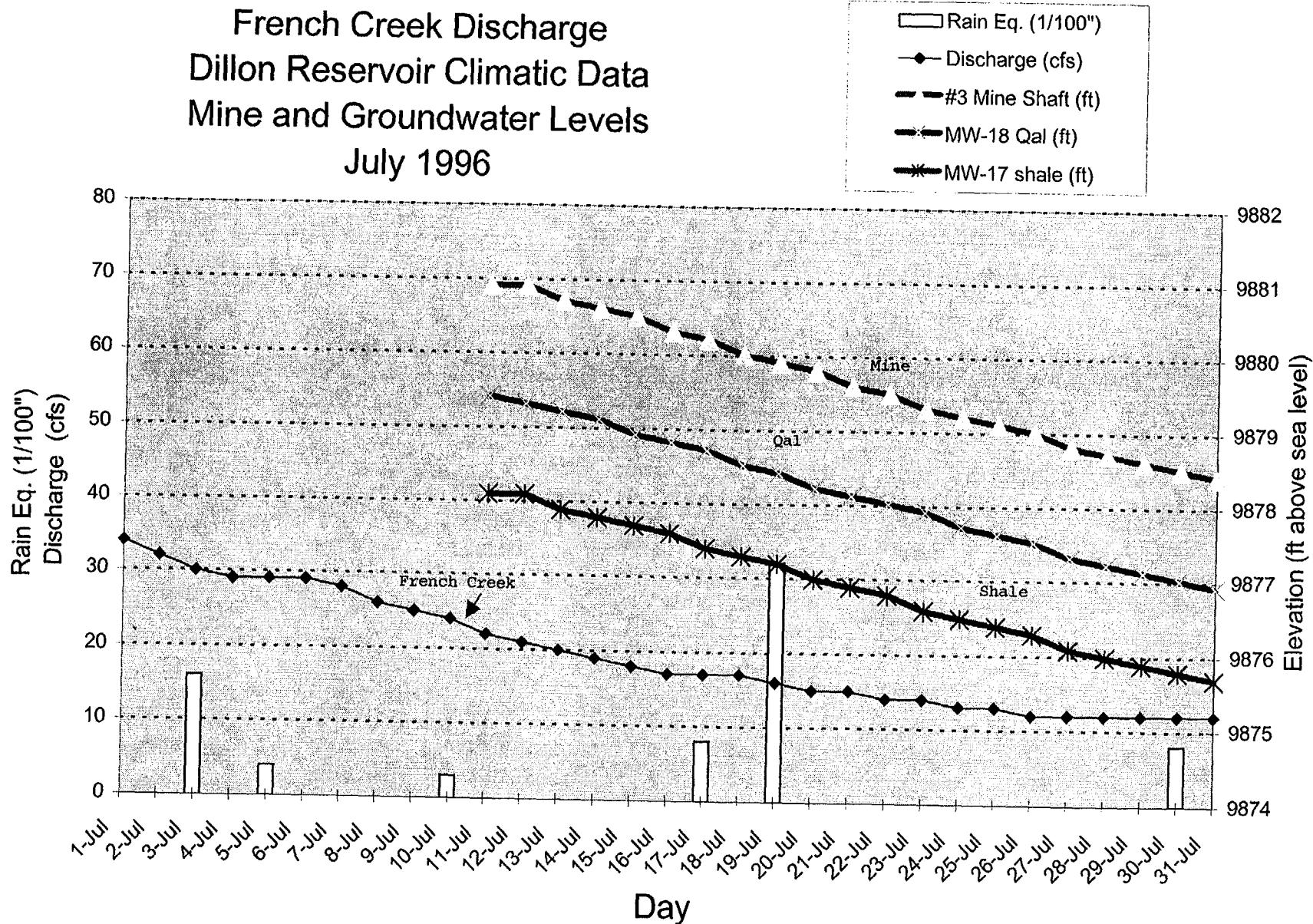


Figure 6-2

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
August 1996

- Rain (1/100")
- ◆ Discharge (cfs)
- - #3 Mine Shaft (ft)
- × MW-18 Qal (ft)
- * MW-17 shale (ft)

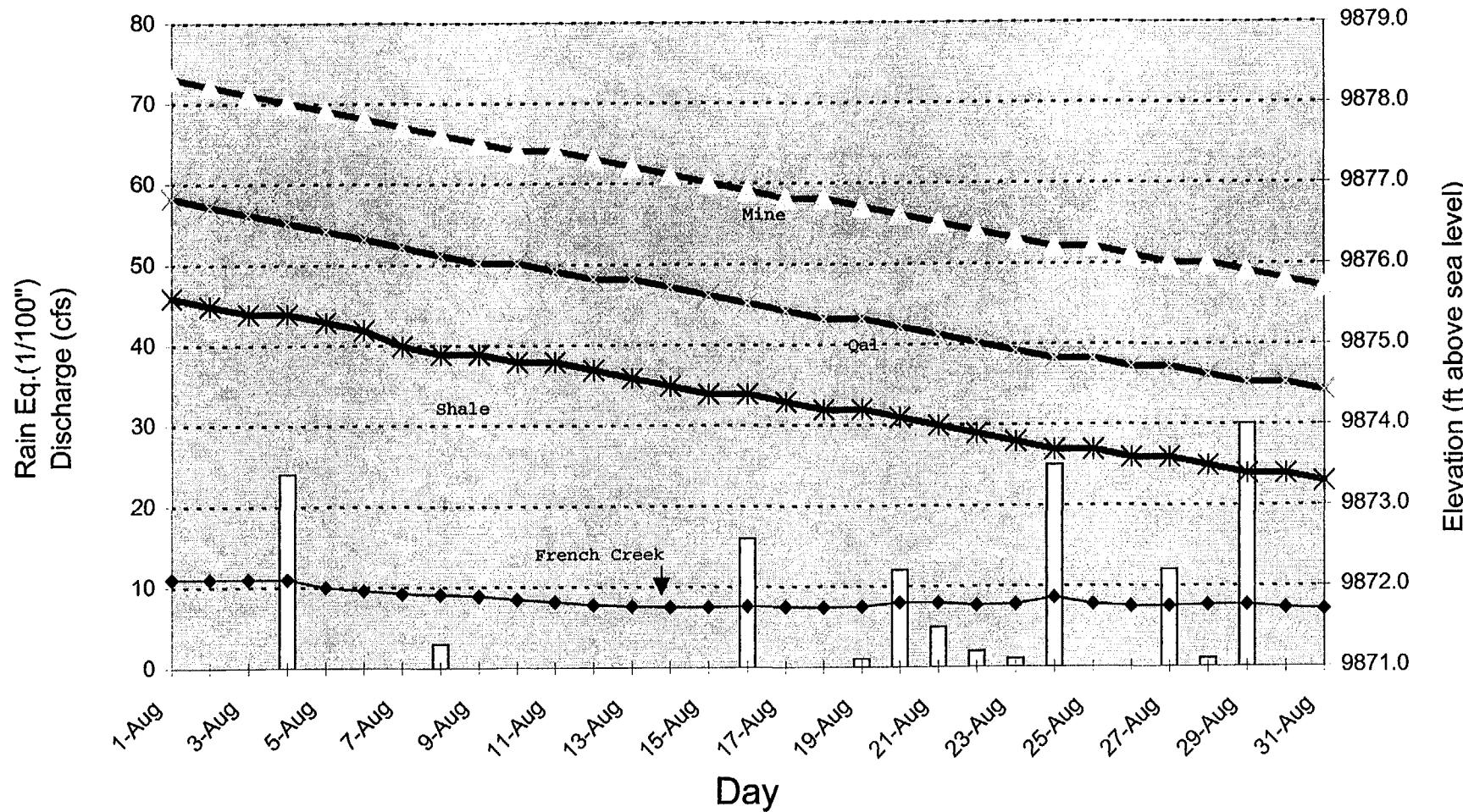


Figure 6-3

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
September 1996

- Snowpack (inches)
- Rain Eq. (1/100")
- ◆ Discharge (cfs)
- MW-17 shale (ft)
- MW-18 Qal (ft)
- - #3 Mine Shaft (ft)

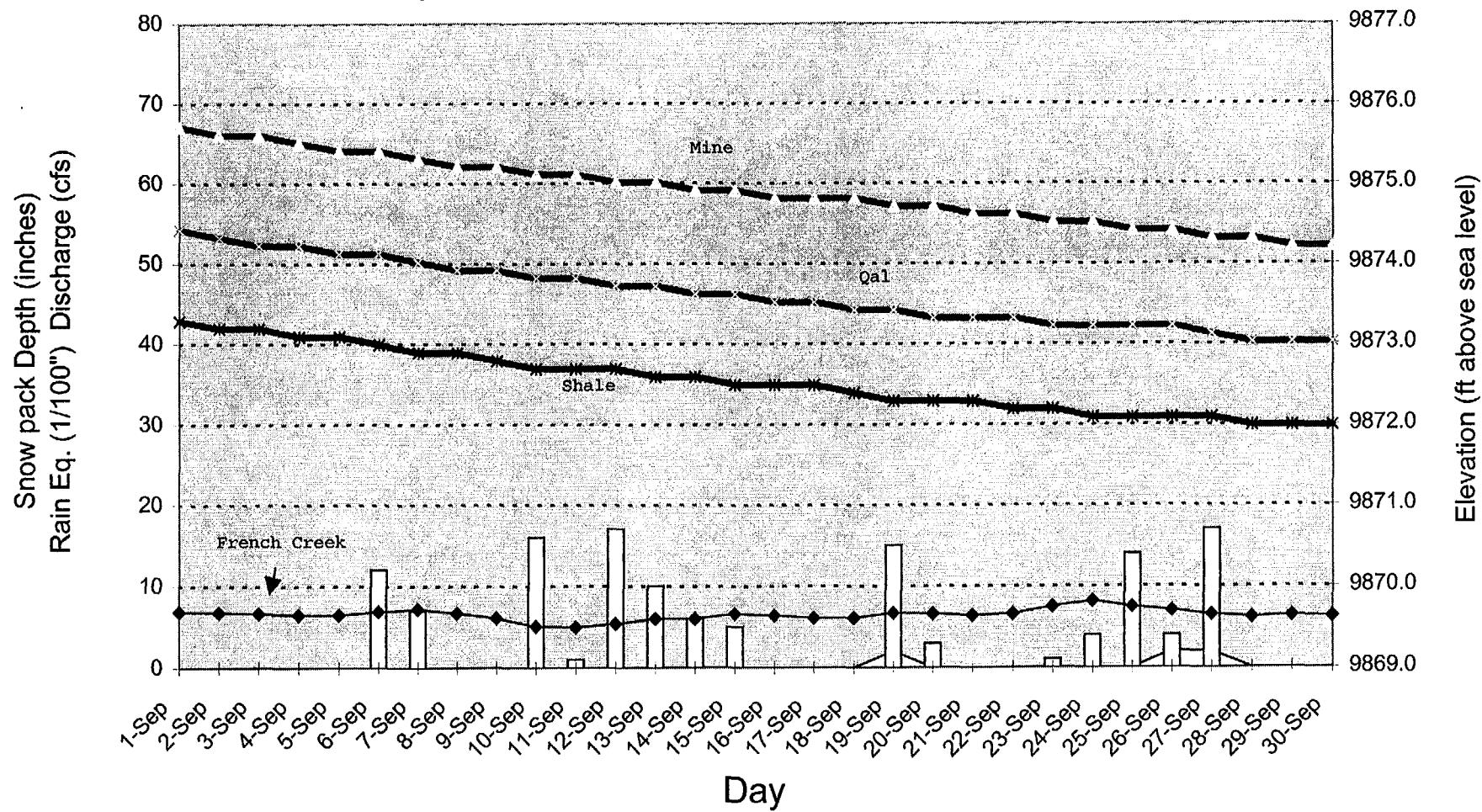


Figure 6-4

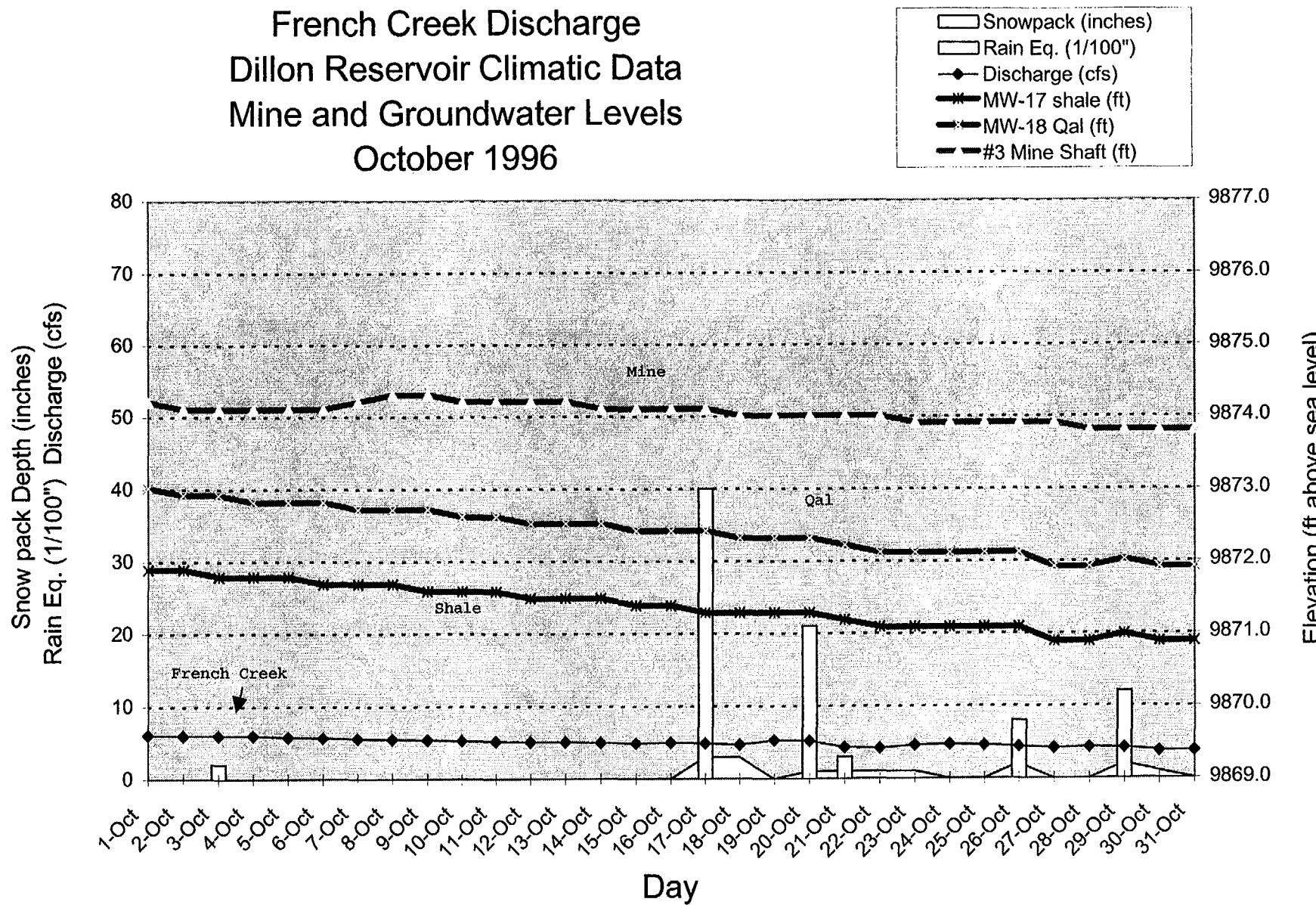


Figure 6-5

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
November 1996

- Snowpack (inches)
- Rain Eq. (1/100")
- Discharge (cfs)
- MW-17 shale (ft)
- MW-18 Qal (ft)
- #3 Mine Shaft (ft)

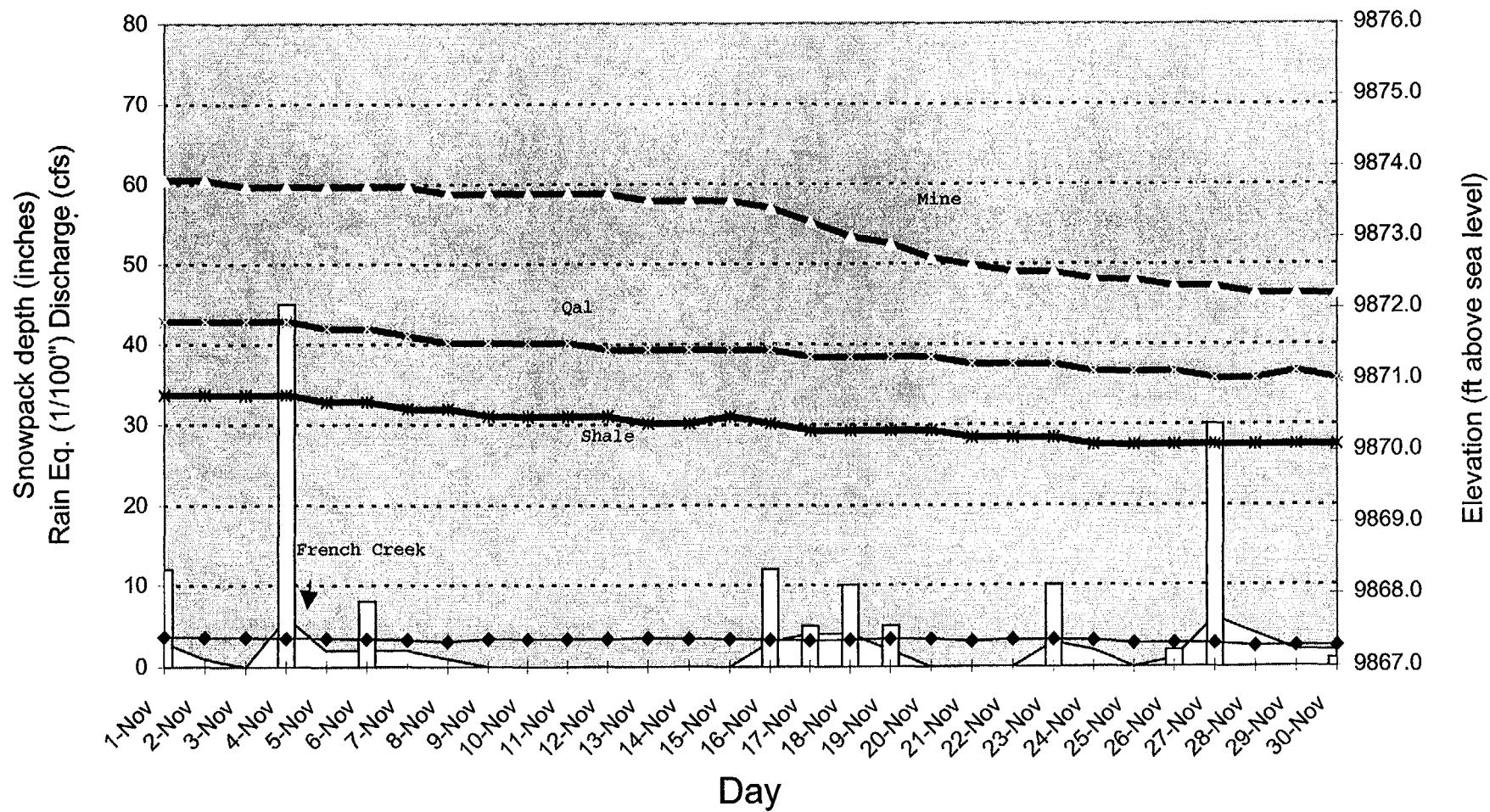


Figure 6-6

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
December 1996

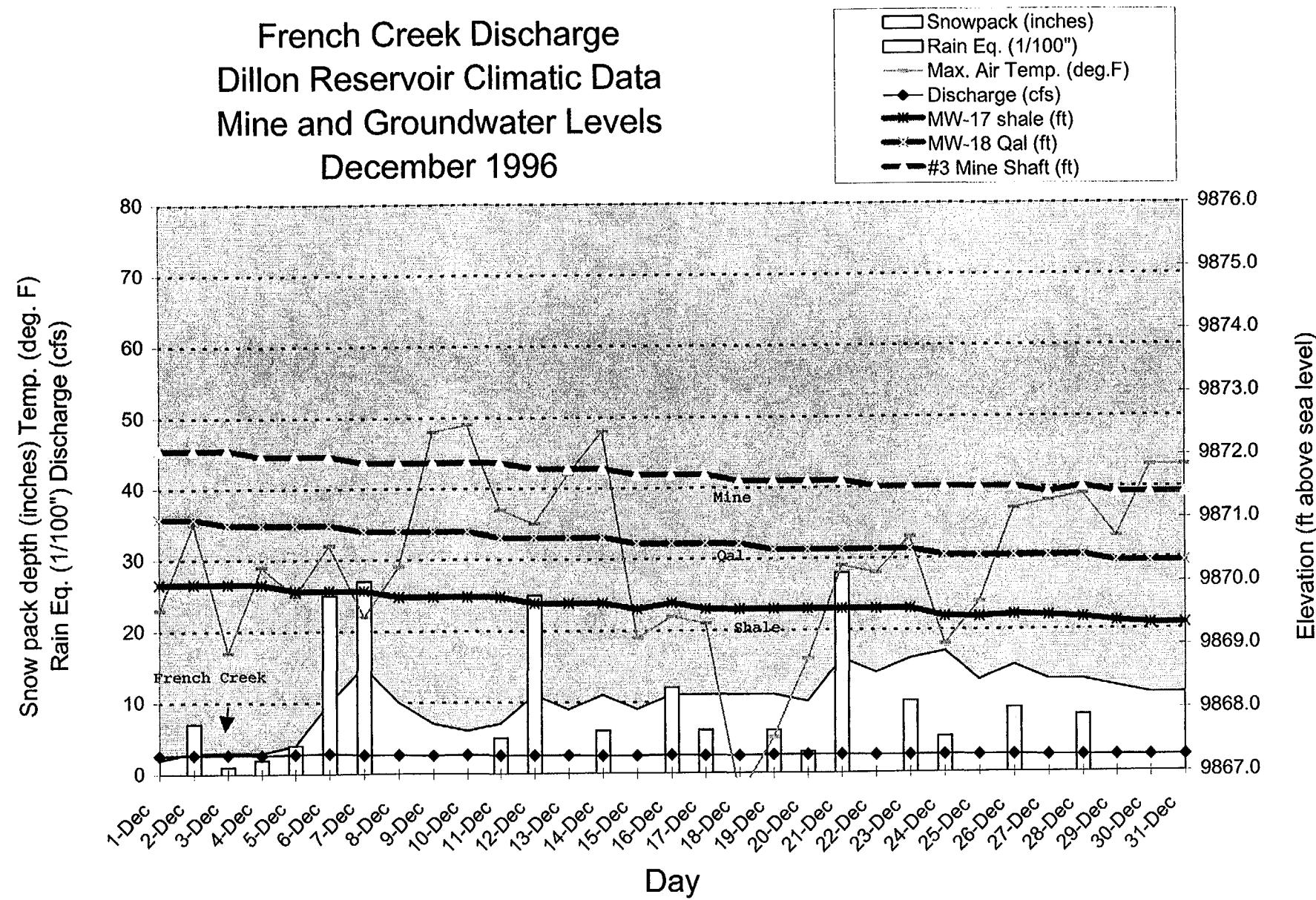


Figure 6-7

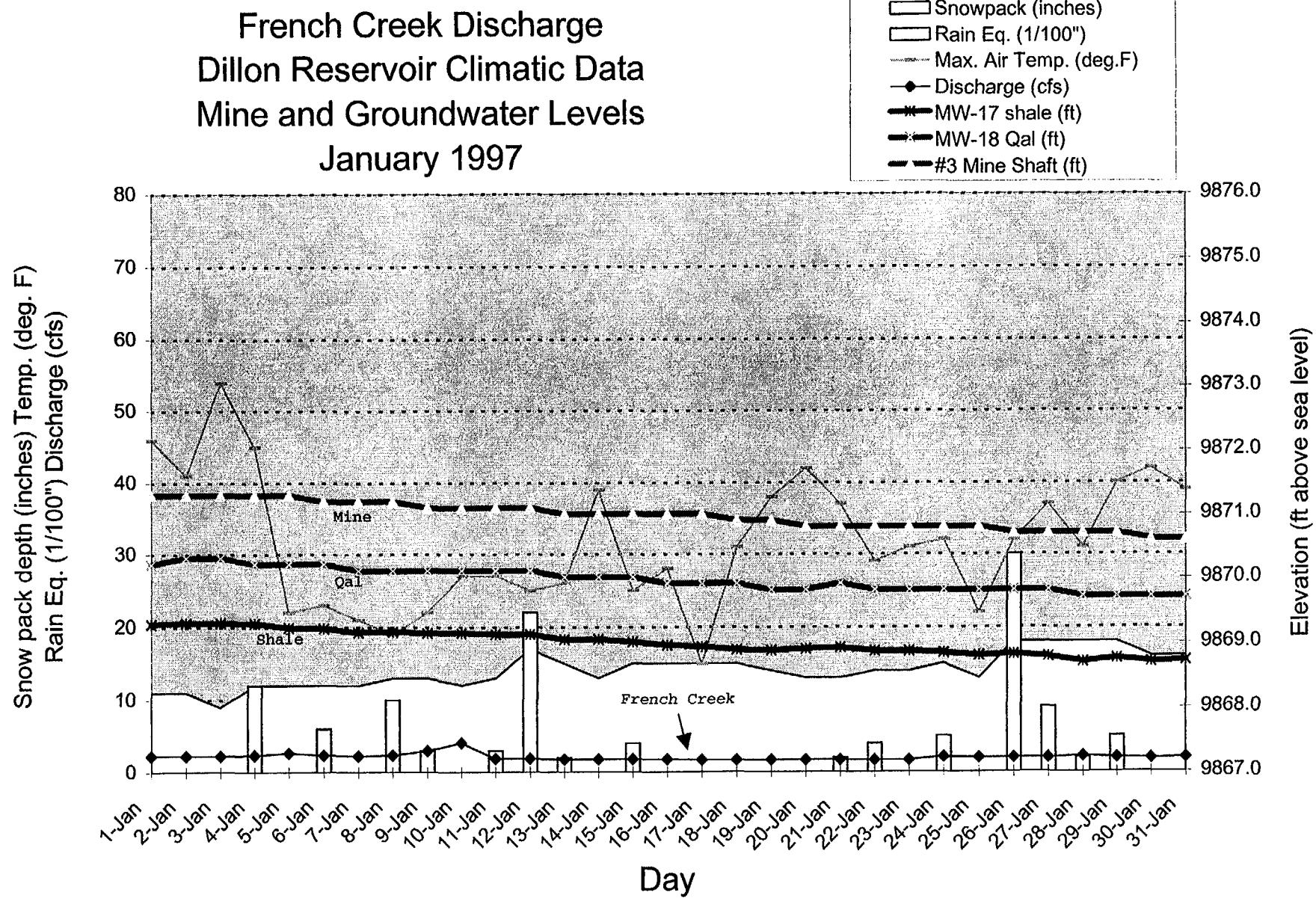


Figure 6-8

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
February 1997

- [] Snowpack (inches)
- [] Rain Eq. (1/100")
- [—] Max. Air temp. (deg.F)
- [●] Discharge (cfs)
- [—] MW-17 shale (ft)
- [—] MW-18 Qal (ft)
- [—] #3 Mine Shaft (ft)

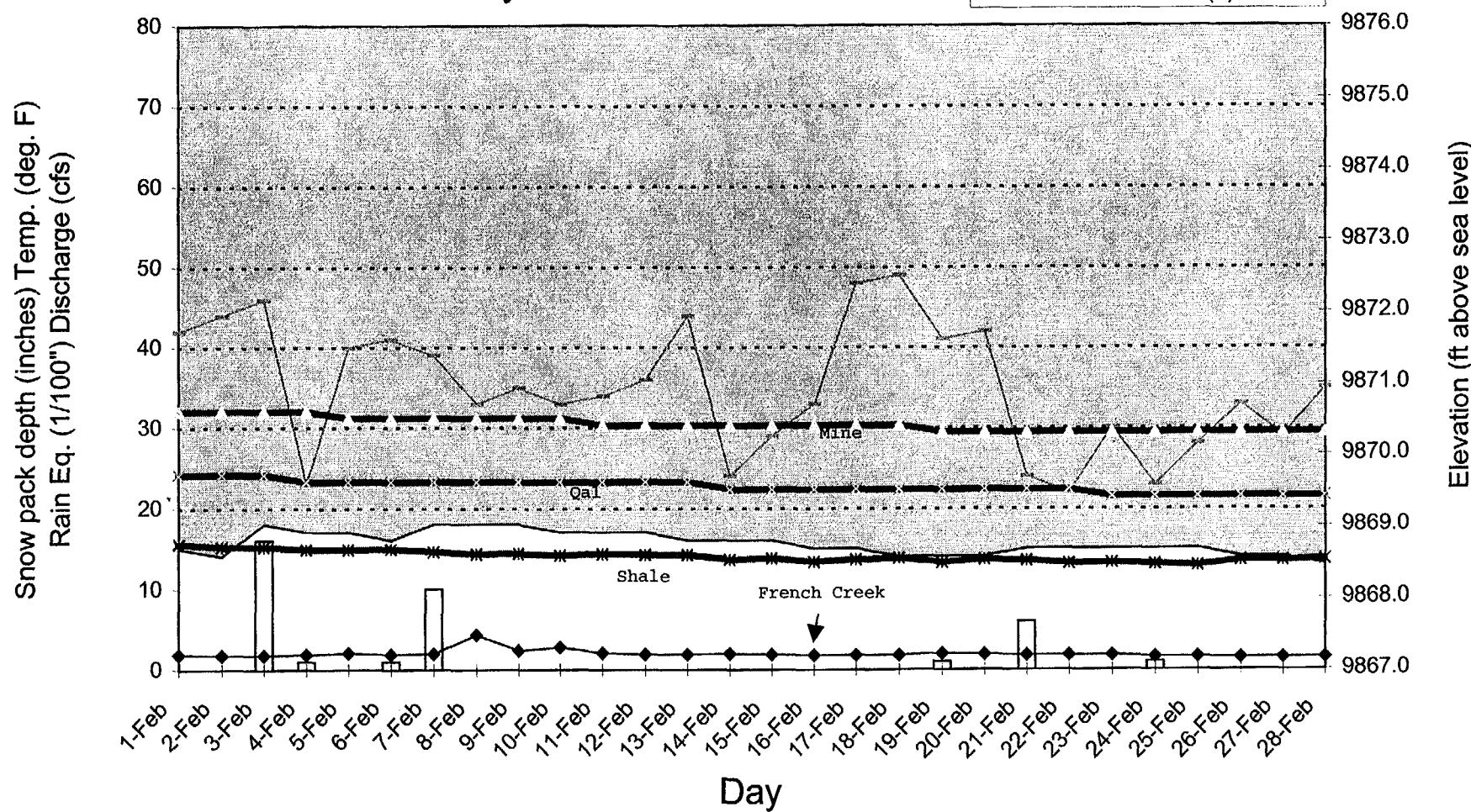


Figure 6-9

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
March 1997

- | |
|------------------------|
| Snowpack (inches) |
| Rain Eq. (1/100") |
| Max. Air temp. (deg.F) |
| Discharge (cfs) |
| MW-17 shale (ft) |
| MW-18 Qal (ft) |
| #3 Mine Shaft (ft) |

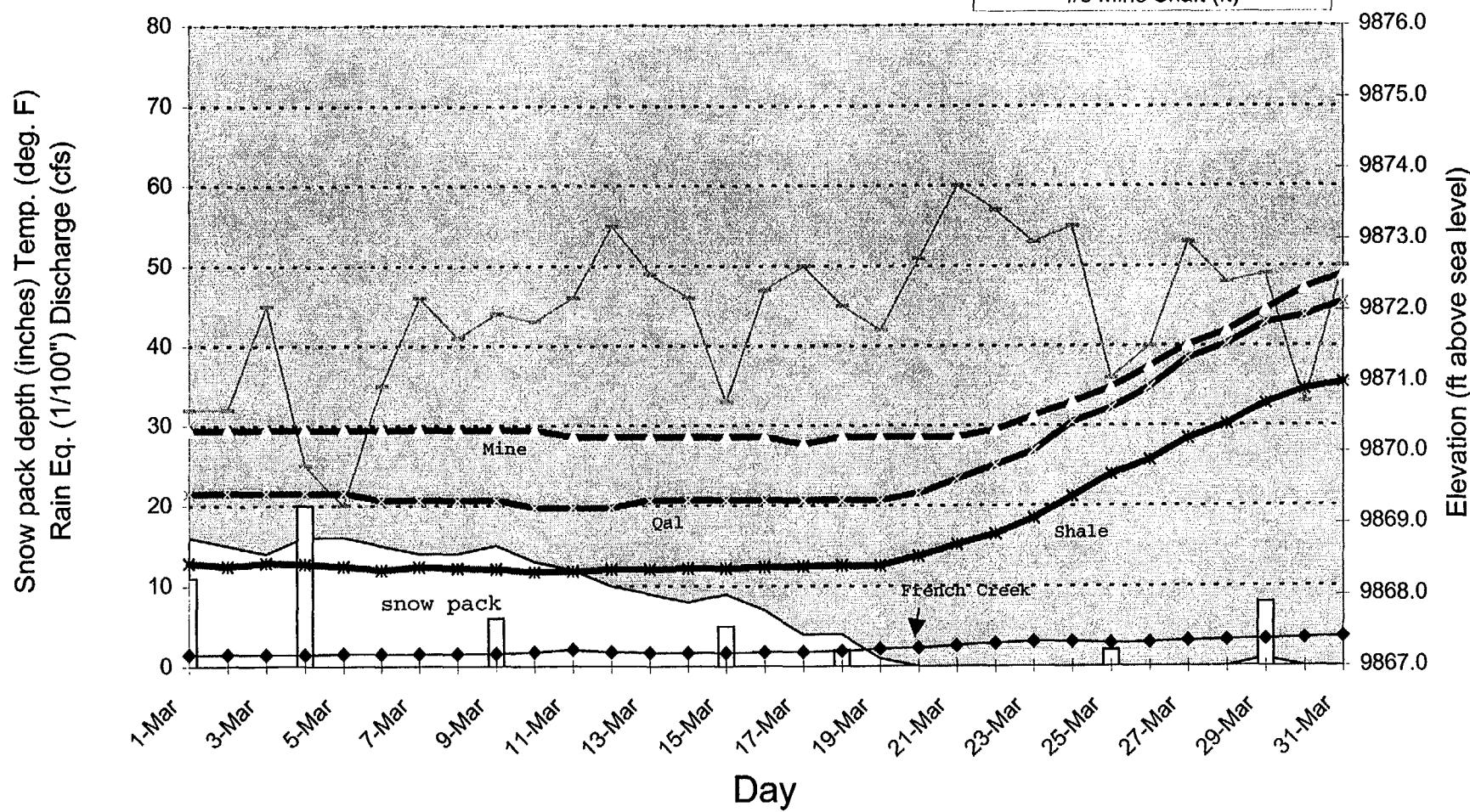


Figure 6-10

French Creek Discharge
Dillon Reservoir Climatic Data
Mine and Groundwater Levels
April 1997

Snowpack (inches)
Rain Eq. (1/100")
MW-17 shale (ft)
MW-18 Qal (ft)
#3 Mine Shaft (ft)
Max. Air temp. (deg.F)
Discharge (cfs)

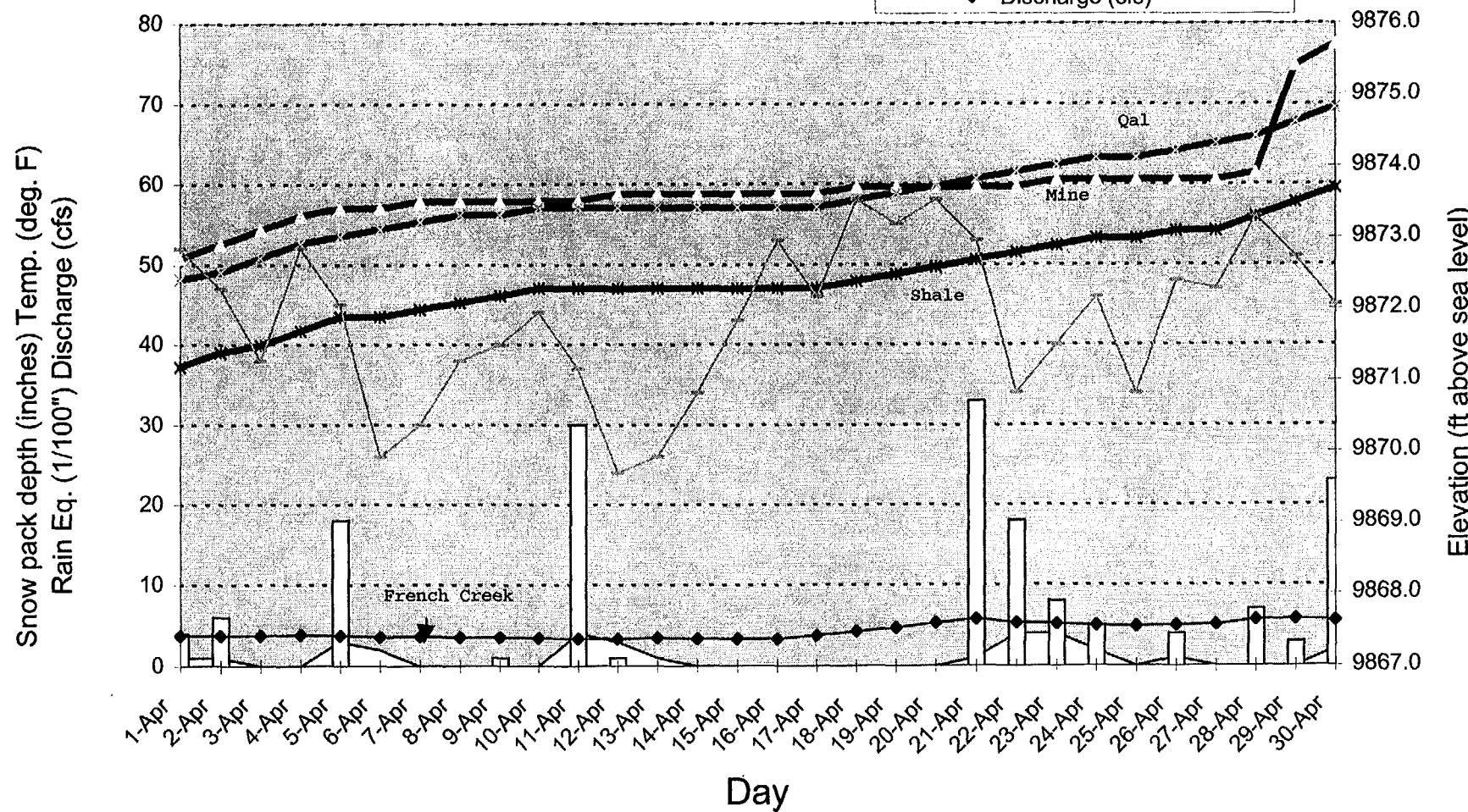


Figure 6-11

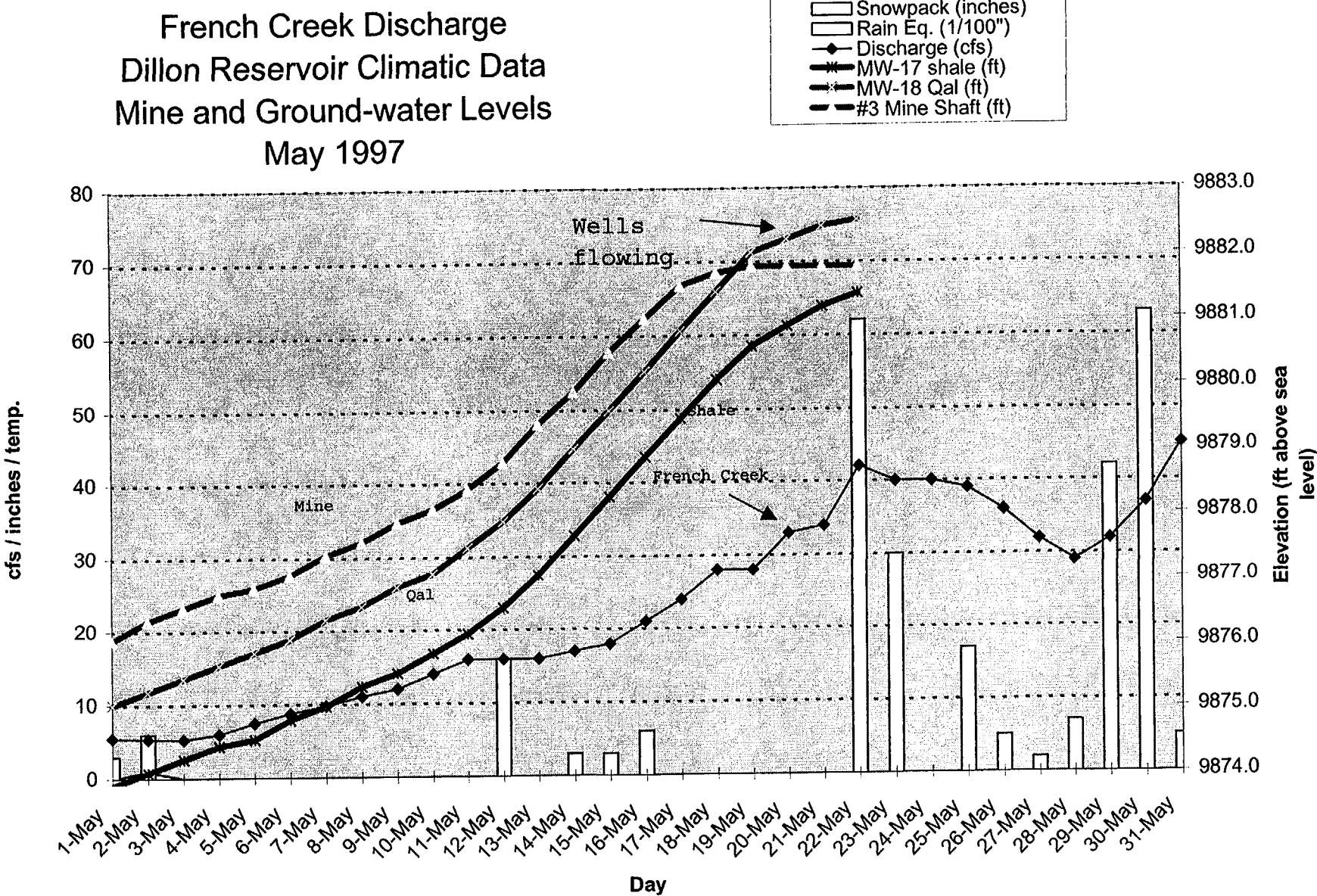


Figure 6-12

French Creek Hydrograph and Dillon Reservoir Climatic Data Spring/Summer 1996

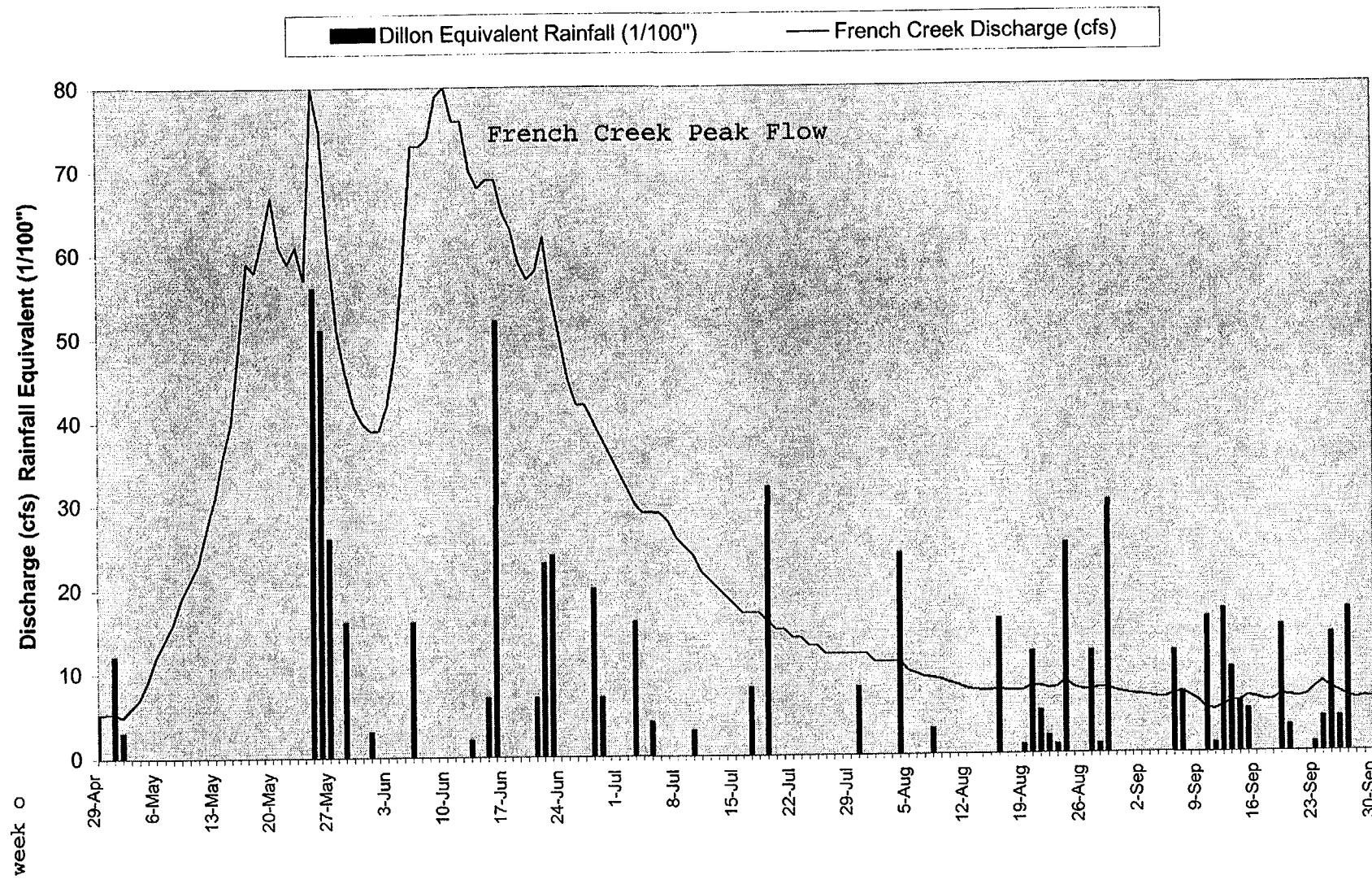


Figure 6-13

French Creek Discharge
Hoosier Pass Climatic Data
Mine and Groundwater Levels
March 1997

□	Snowpack Water Eq. (inches)
- - -	Max. Air Temp. (deg.F)
●	French Creek Discharge (cfs)
—	MW-17 shale (ft)
—	MW-18 Qal (ft)
- - -	#3 Mine Shaft (ft)

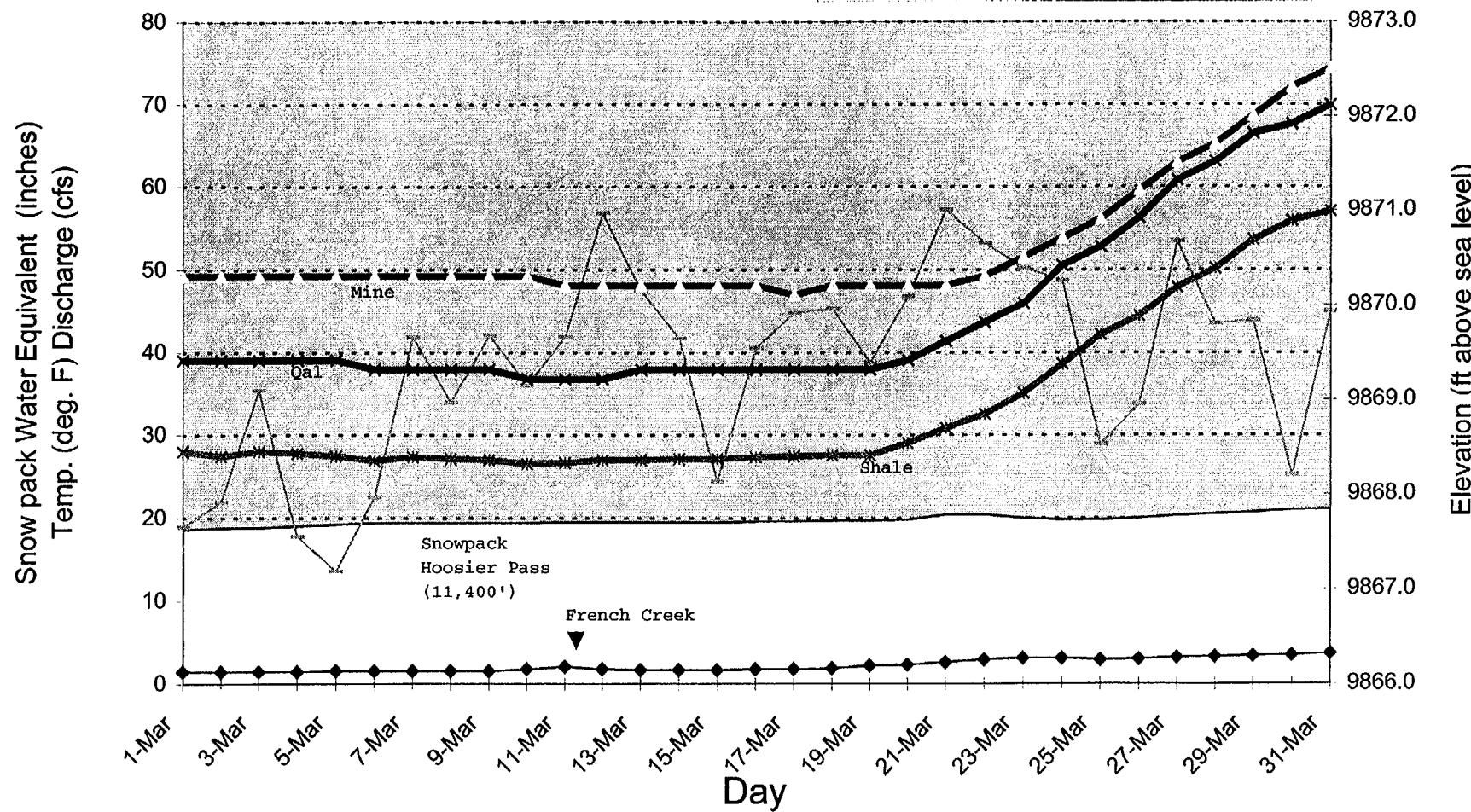


Figure 6-14

**French Creek Discharge
Hoosier Pass Climatic Data
Mine and Groundwater Levels
April 1997**

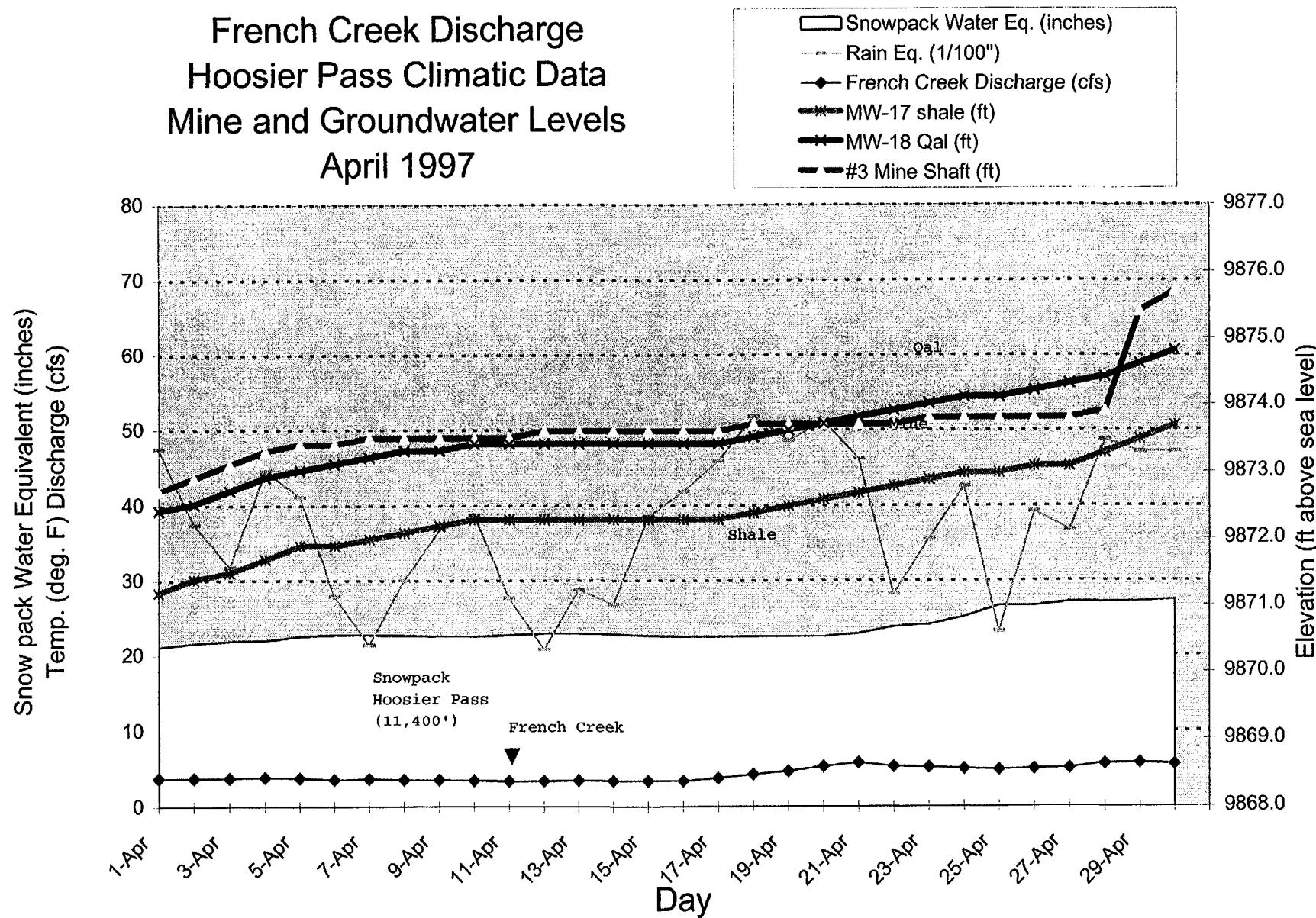


Figure 6-15

French Creek Discharge
Hoosier Pass Climatic Data
Mine and Groundwater Levels
May 1997

- Snowpack Water Eq. (inches)
- Max. Air Temp. (deg. F)
- ◆ French Creek Discharge (cfs)
- * MW-17 shale (ft)
- MW-18 Qal (ft)
- - #3 Mine Shaft (ft)

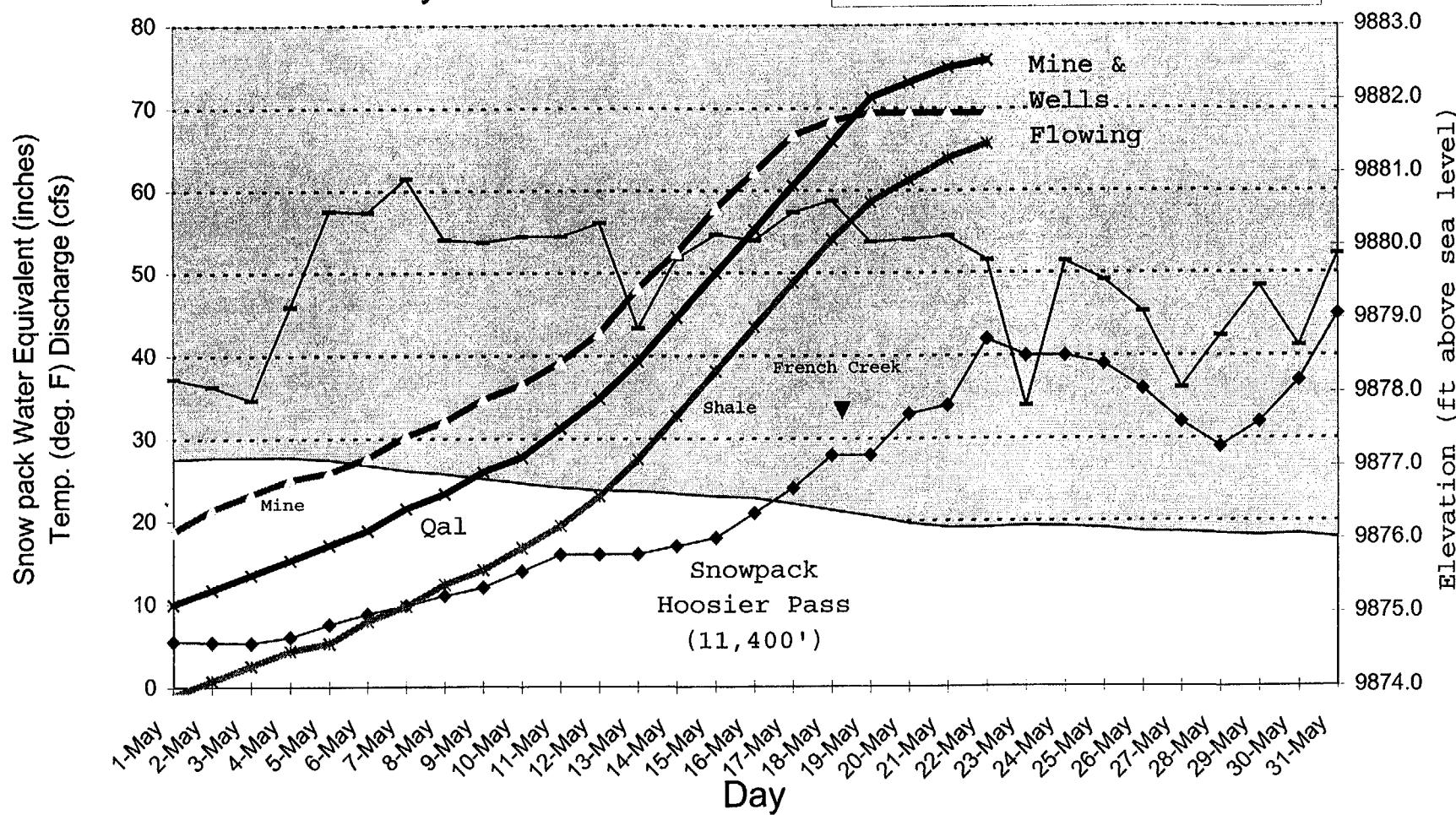


Figure 6-16

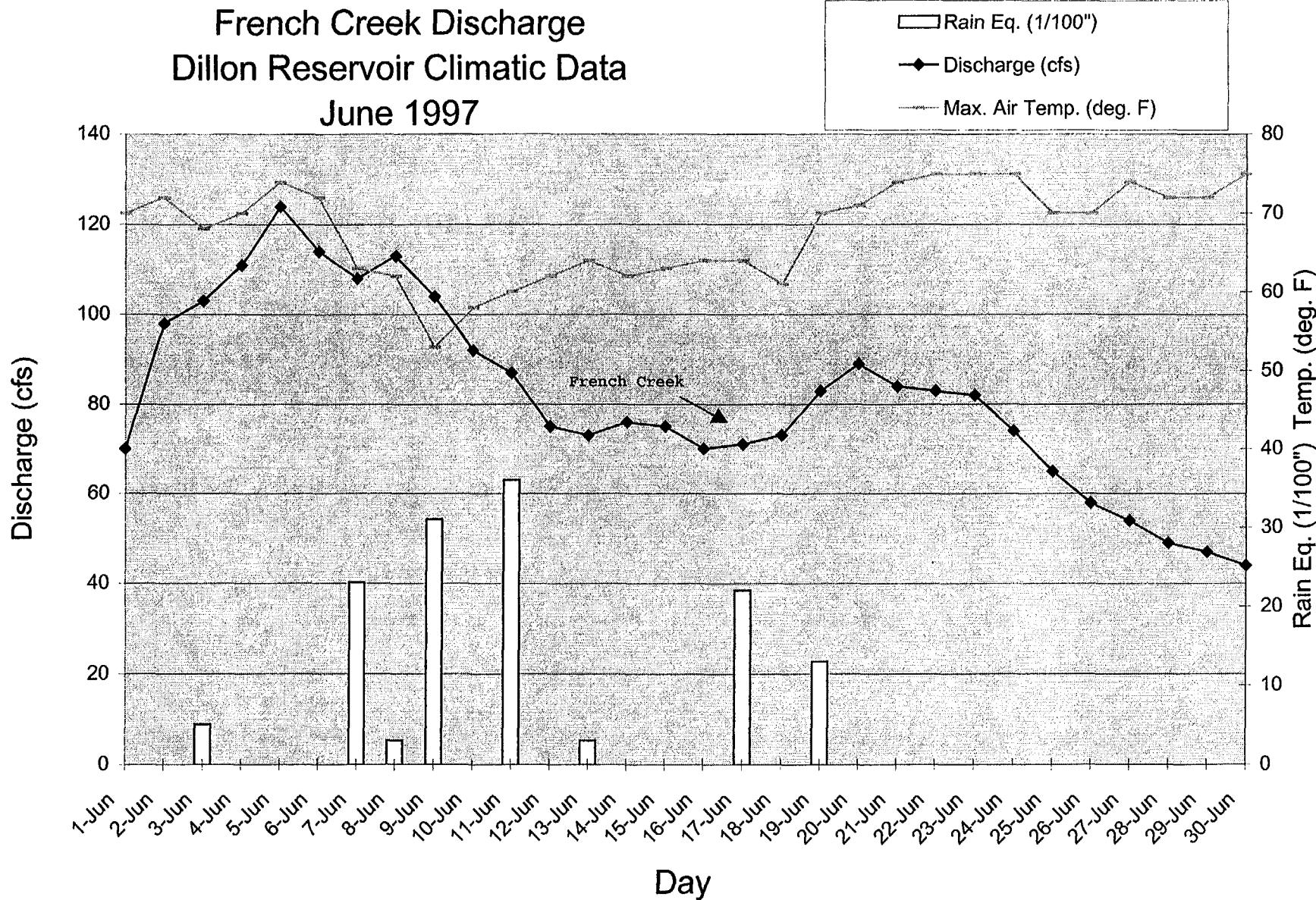


Figure 6-17

French Creek Discharge
Hoosier Pass Climatic Data
June 1997

Snowpack Water Eq. (inches)
French Creek Discharge (cfs)
Max. Air Temp. (deg.F)

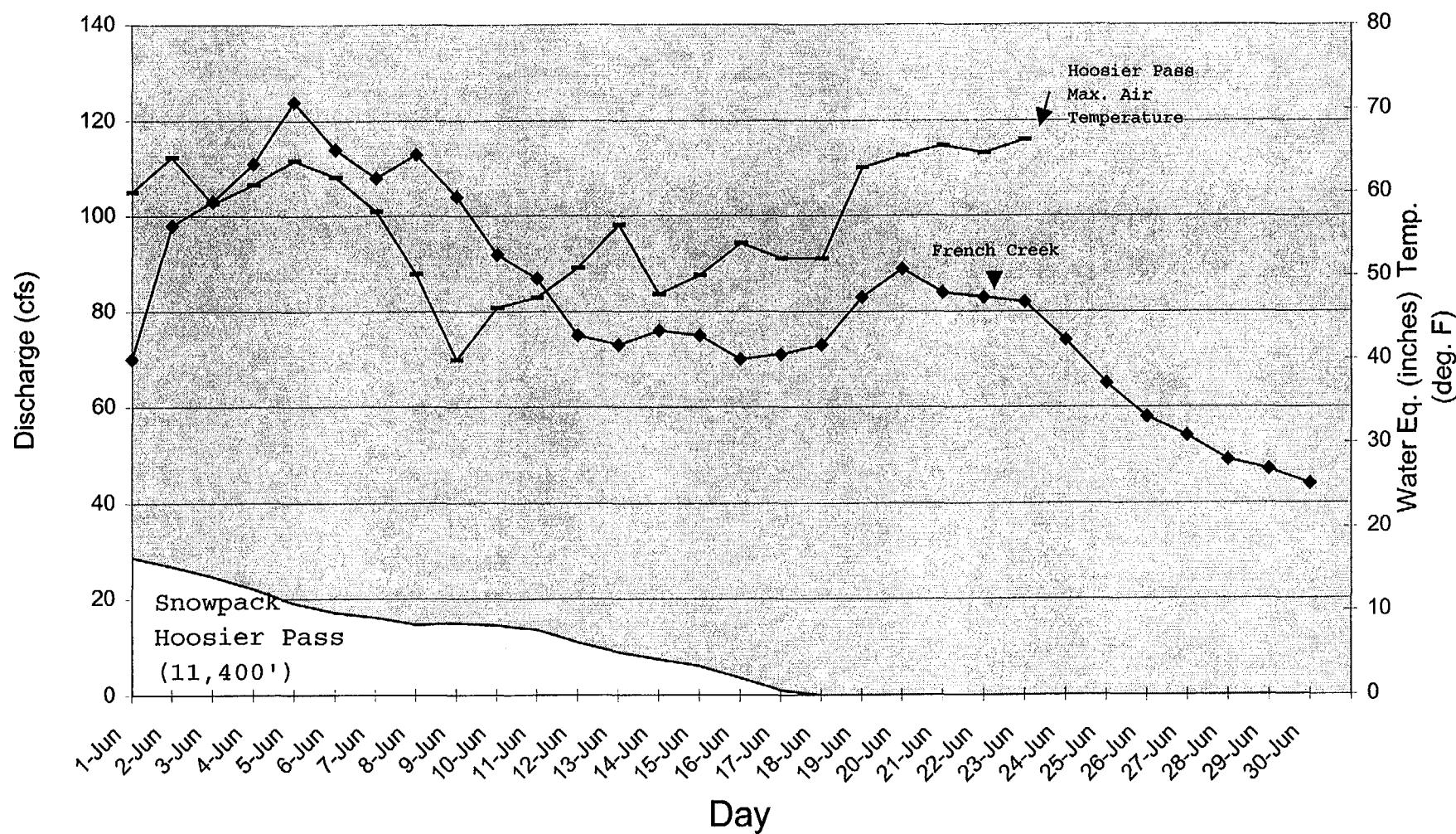


Figure 6-18

French Creek Discharge
Dillon Reservoir Climatic Data
Groundwater Levels March 1998

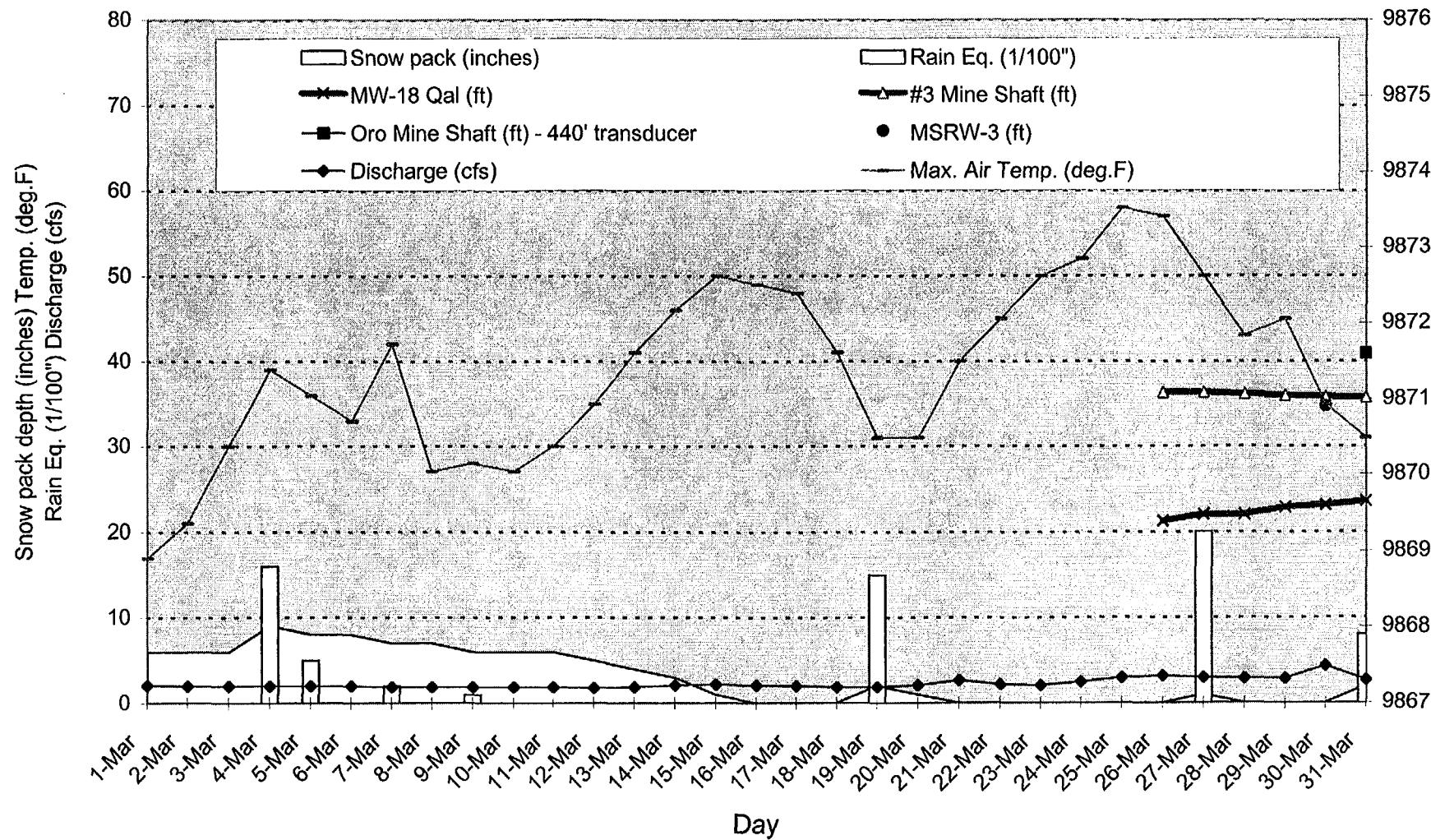


Figure 6-19

French Creek Discharge
Dillon Reservoir Climatic Data
Groundwater Levels April 1998

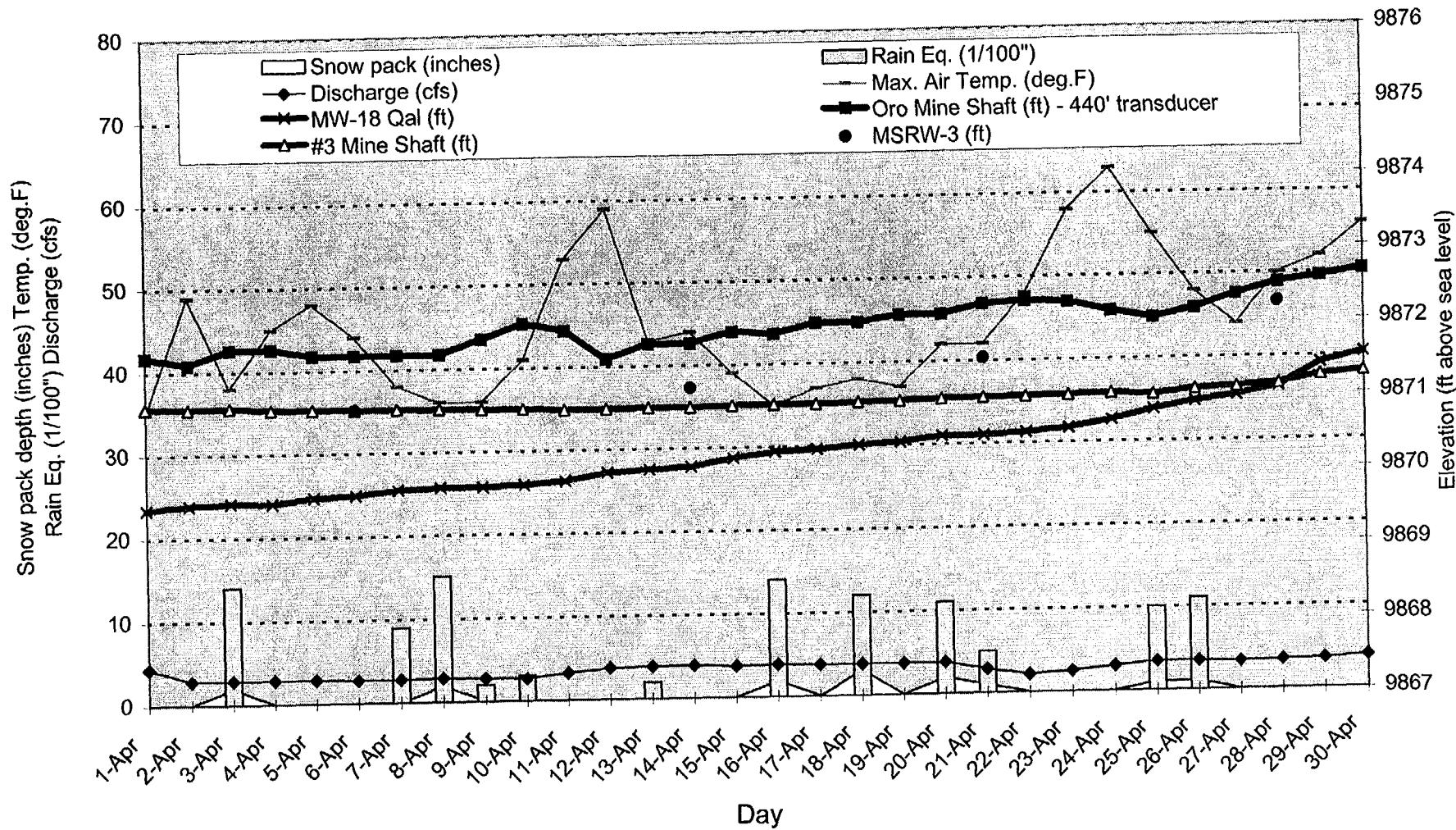


Figure 6-20

French Creek Discharge
Hoosier Pass & Dillon Climatic Data
Groundwater Levels May 1998

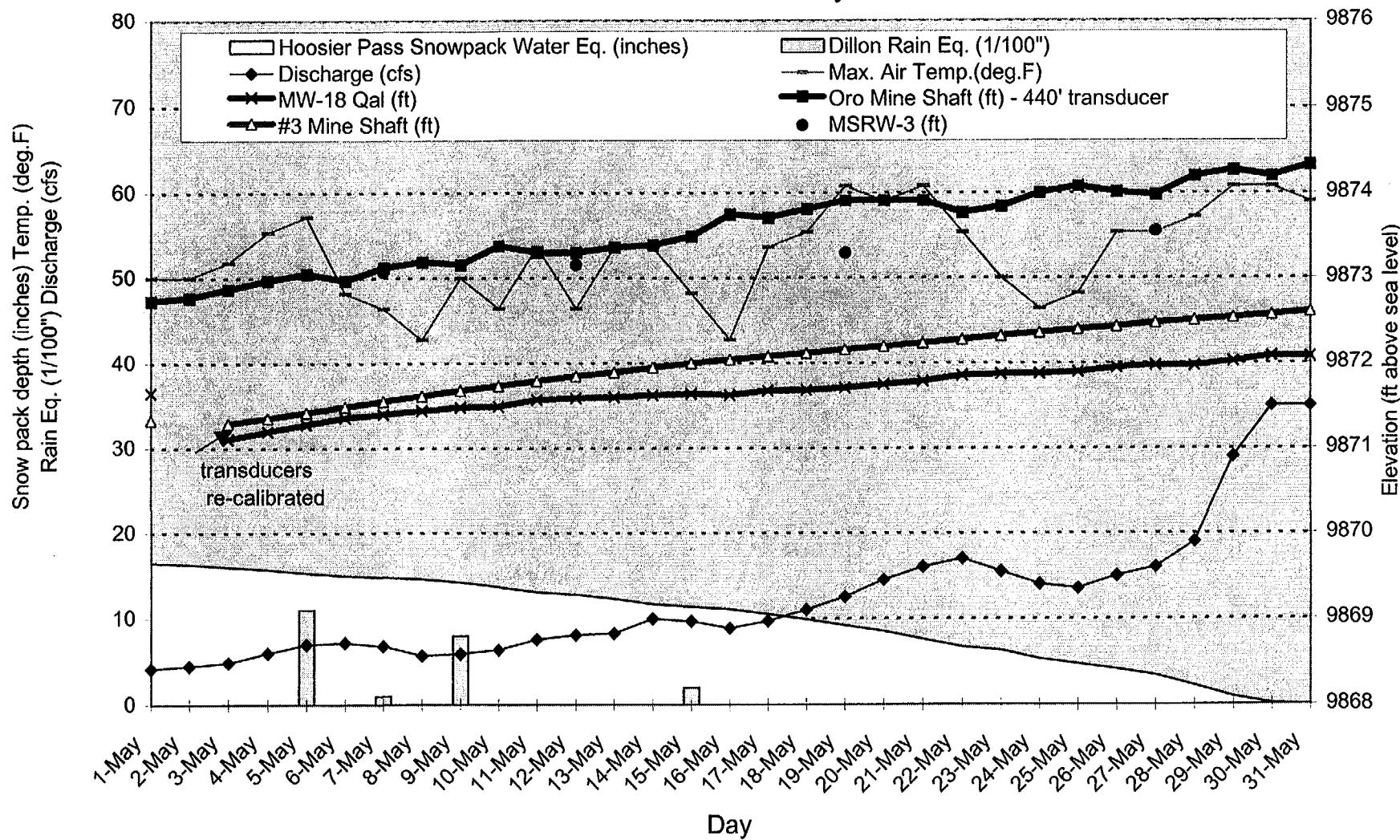


Figure 6-21

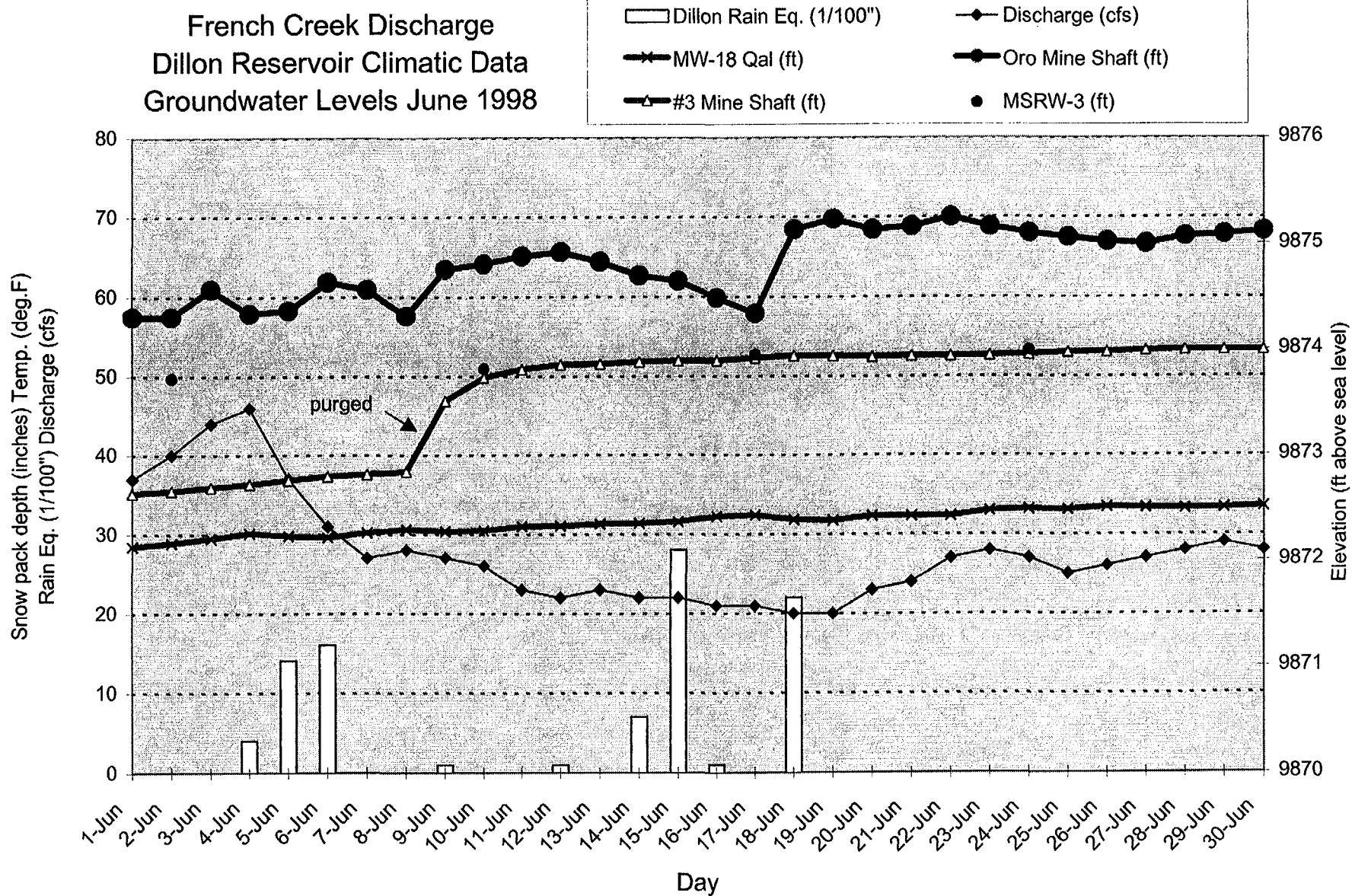


Figure 6-22

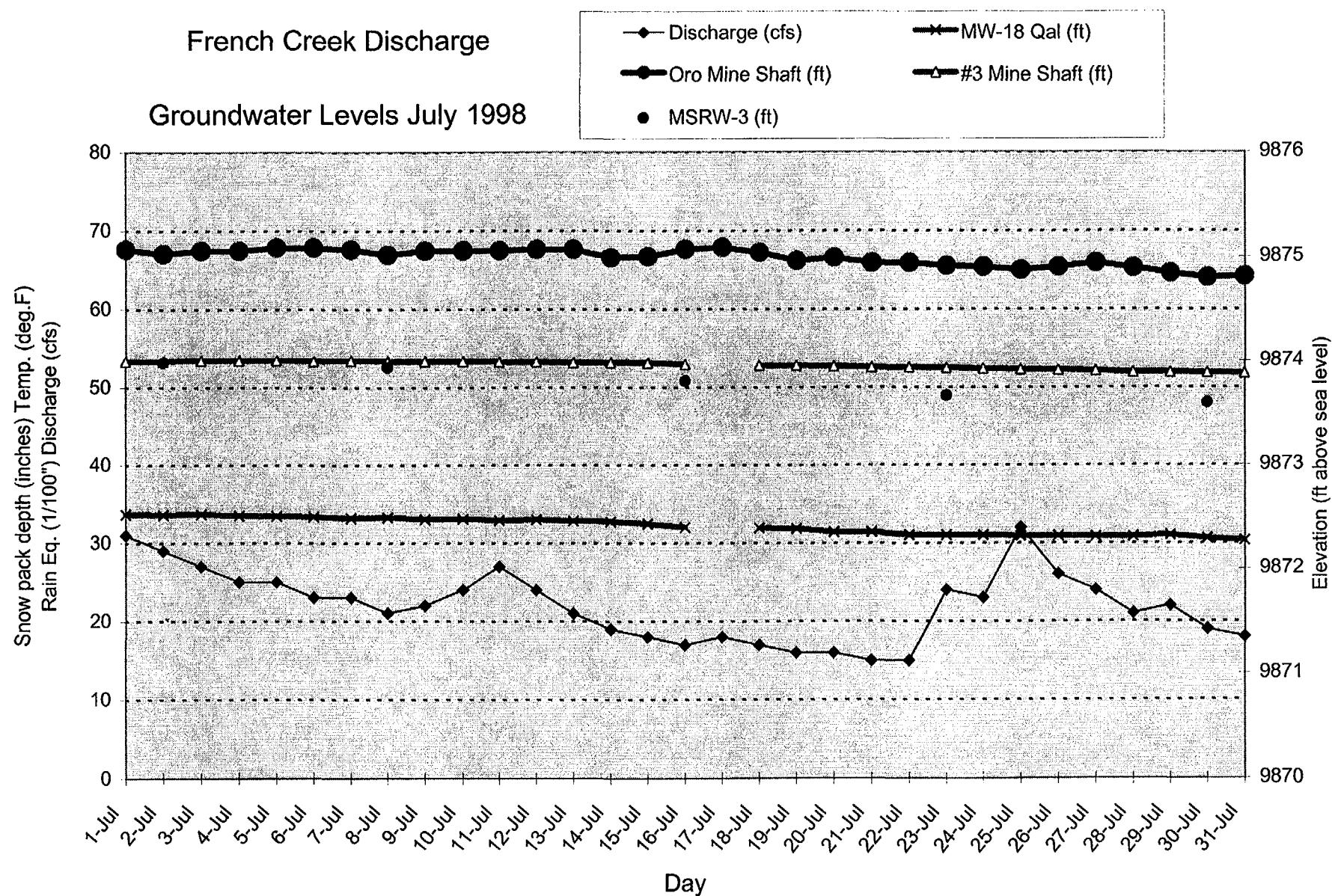


Figure 6-23

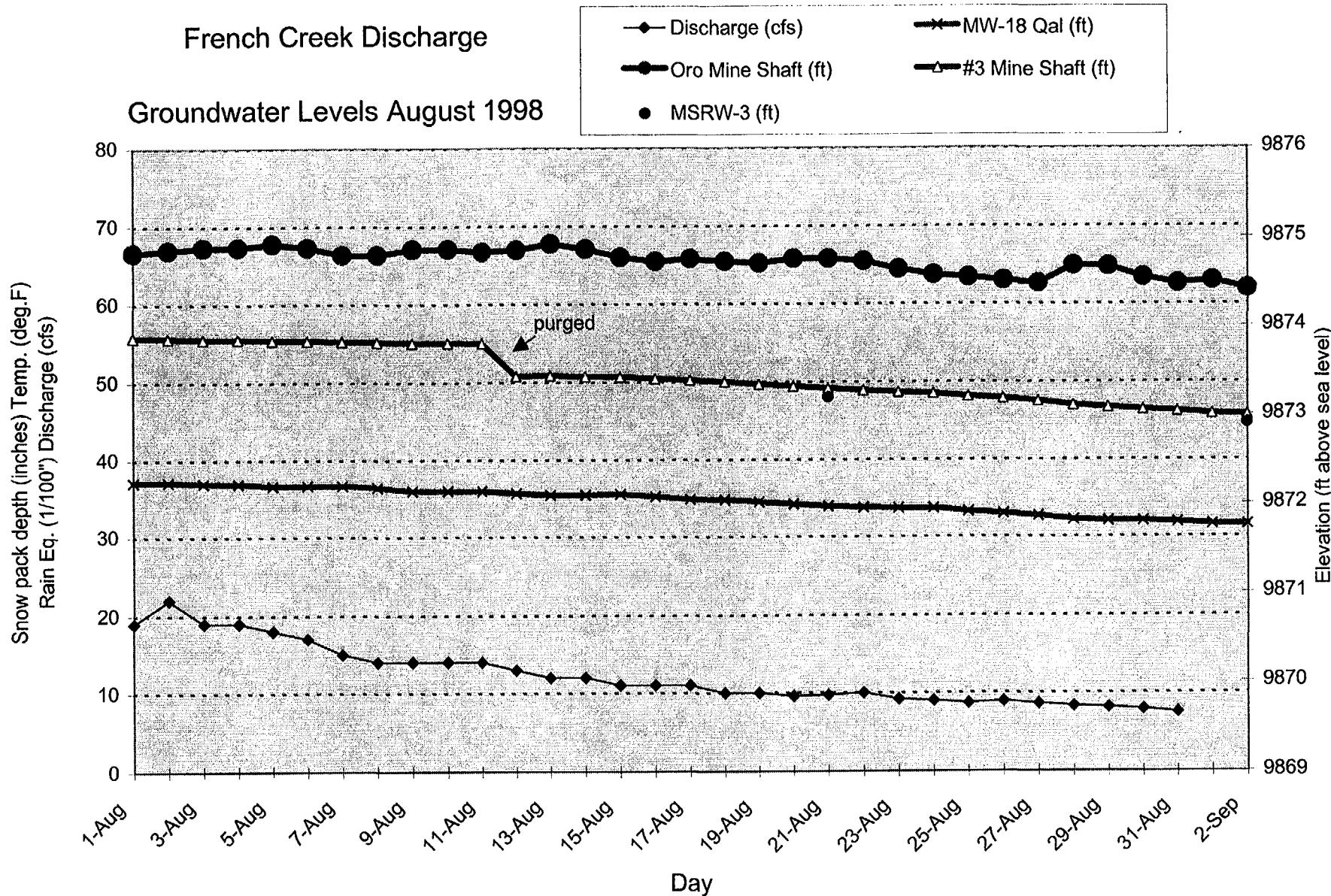


Figure 6-24

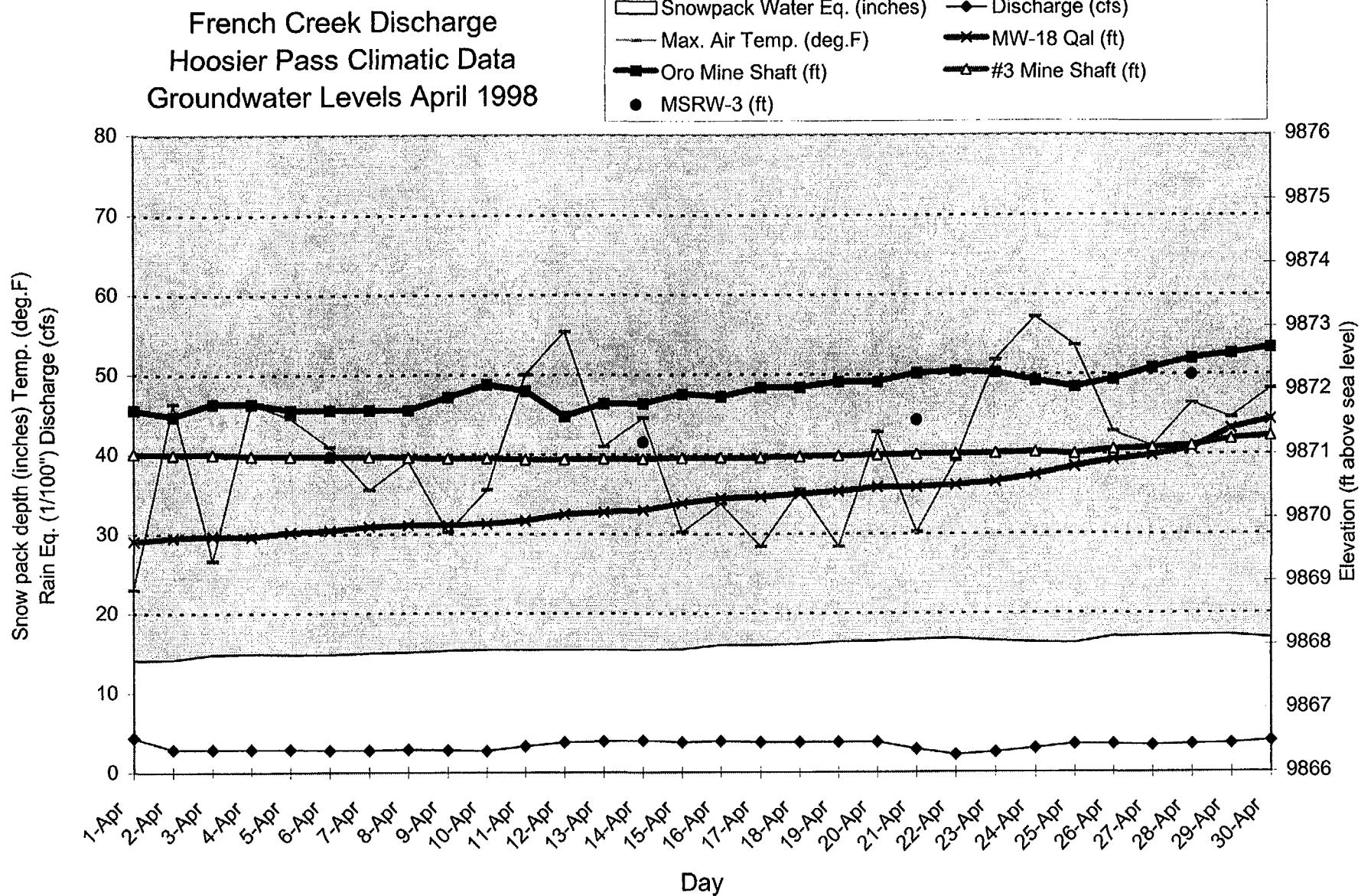
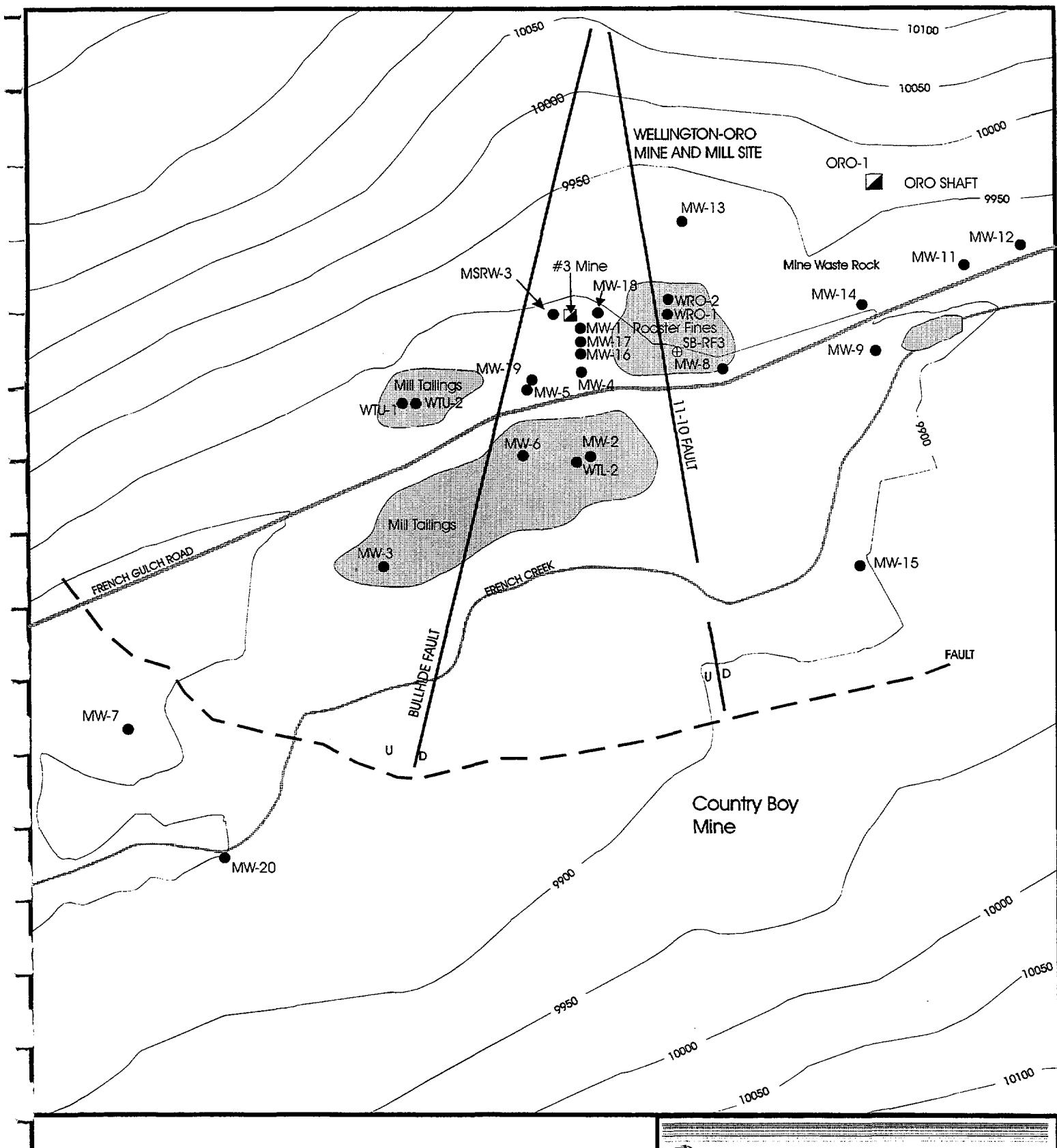


Figure 6-25



N

- ⊕ SB-RF3 Soil Boring
- MW-15 Monitoring Well
(Locations Are Approximated)
- ORO-1 Mine Shaft

Scale 1" = 250'

 AMERICAN GEOLOGICAL SERVICES, INC. Environmental, Geological, and Natural Resource Consultants	
Figure 6-26	
French Gulch Ground Water Sample Location Map	
Project Name:	French Gulch
Project Number:	CO97DE-056
Date:	10/9/98
Drawn By:	TKS
Reviewed By:	AM

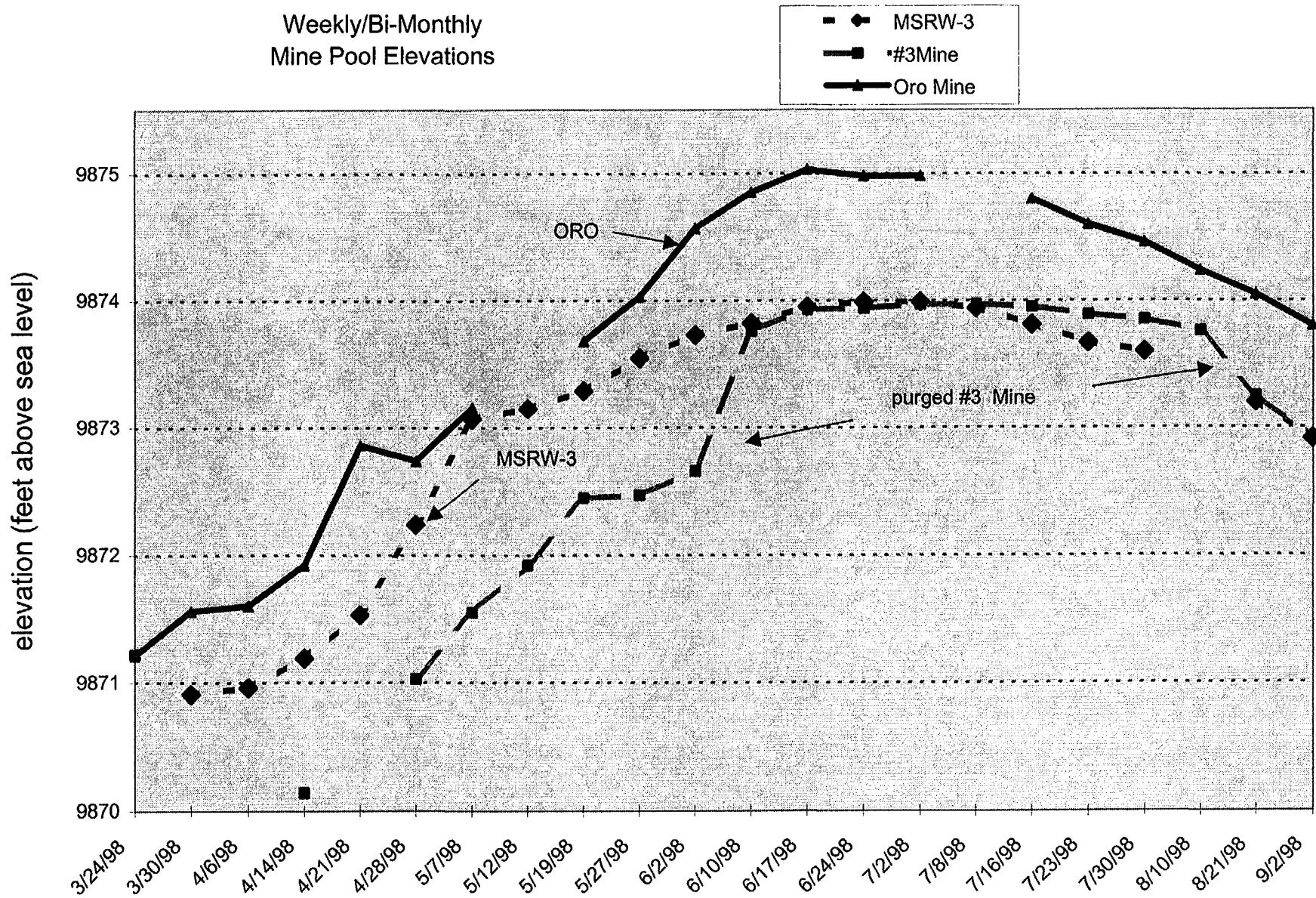


Figure 6-27

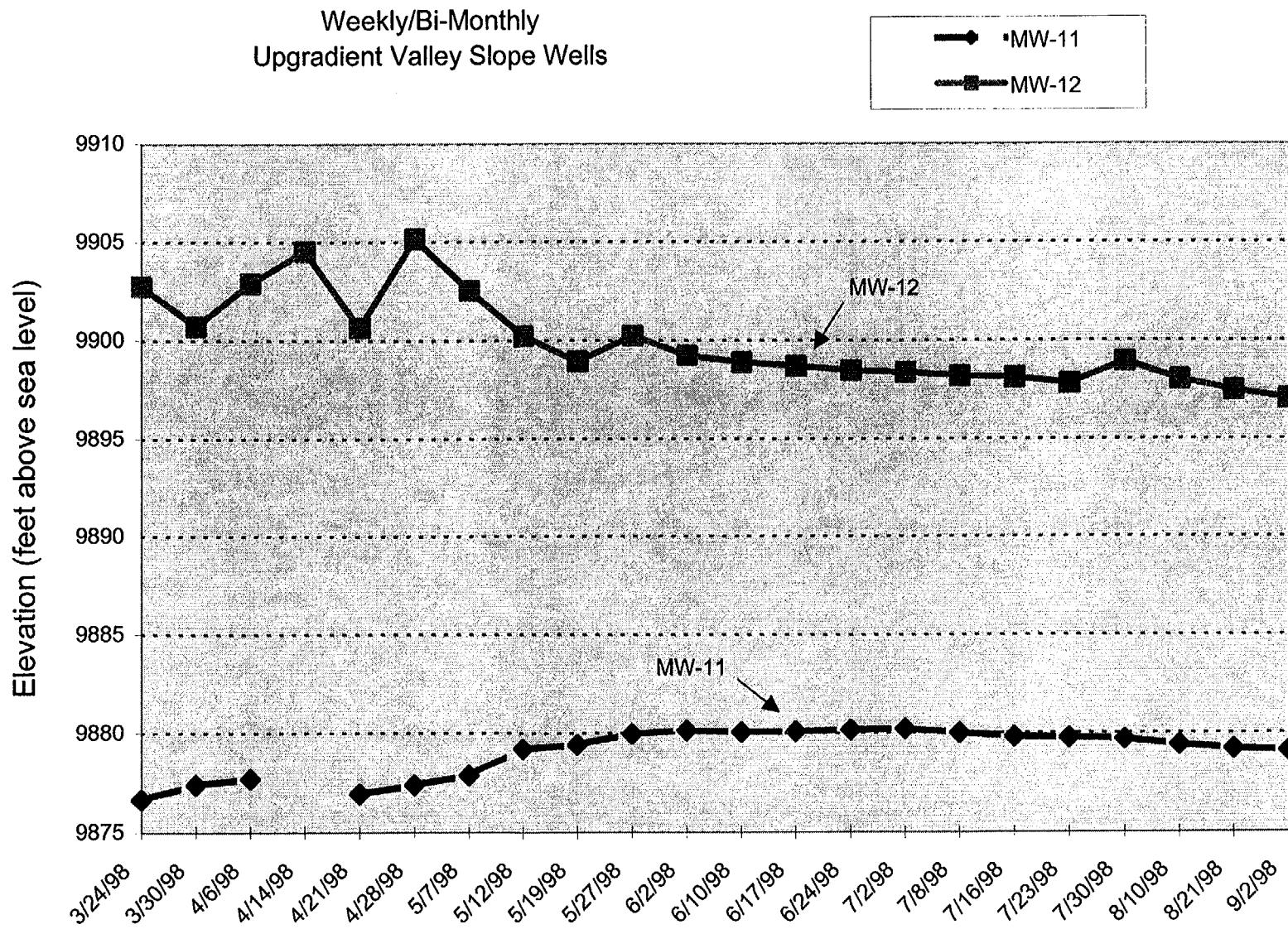


Figure 6-28

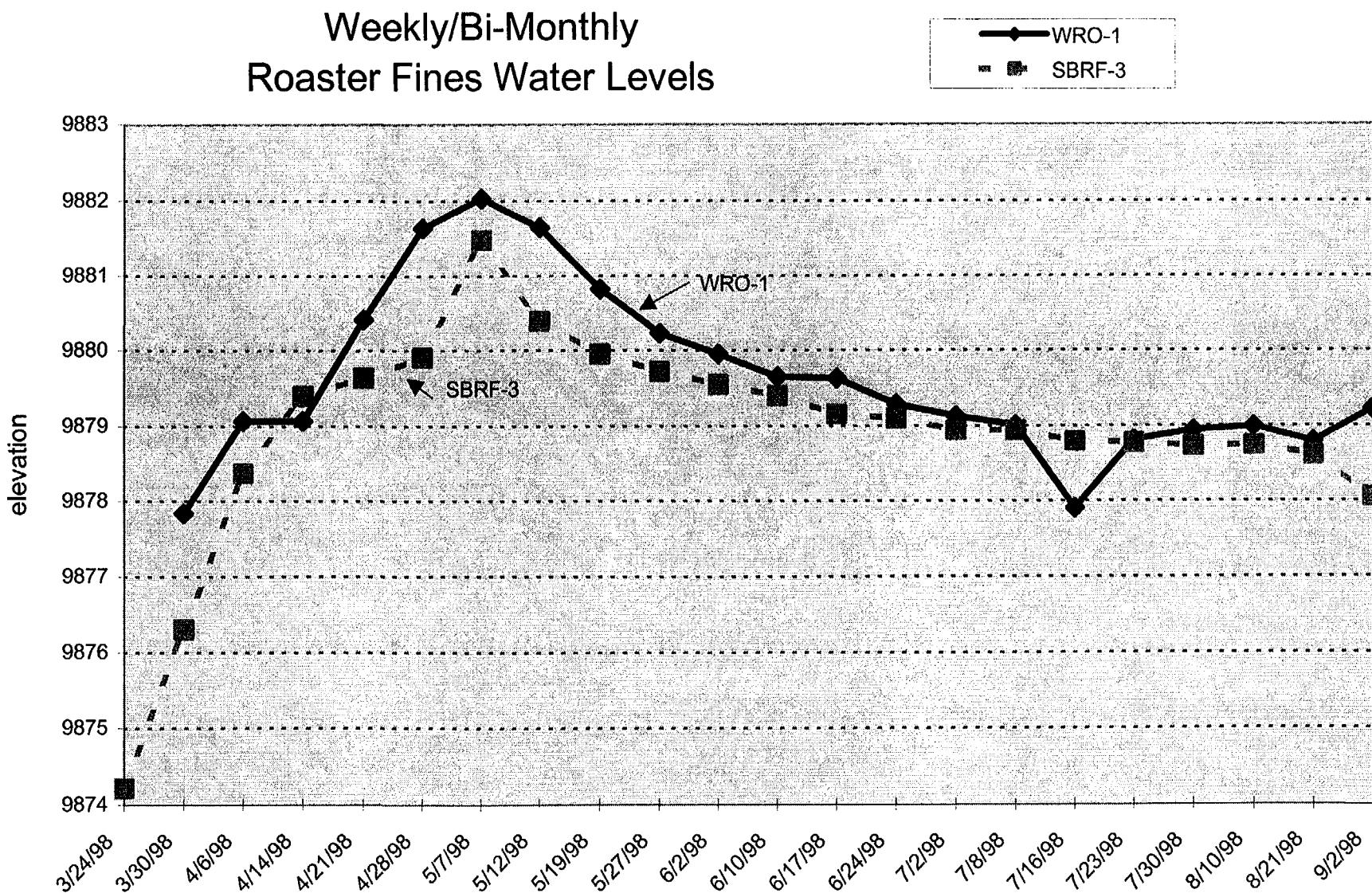


Figure 6-29

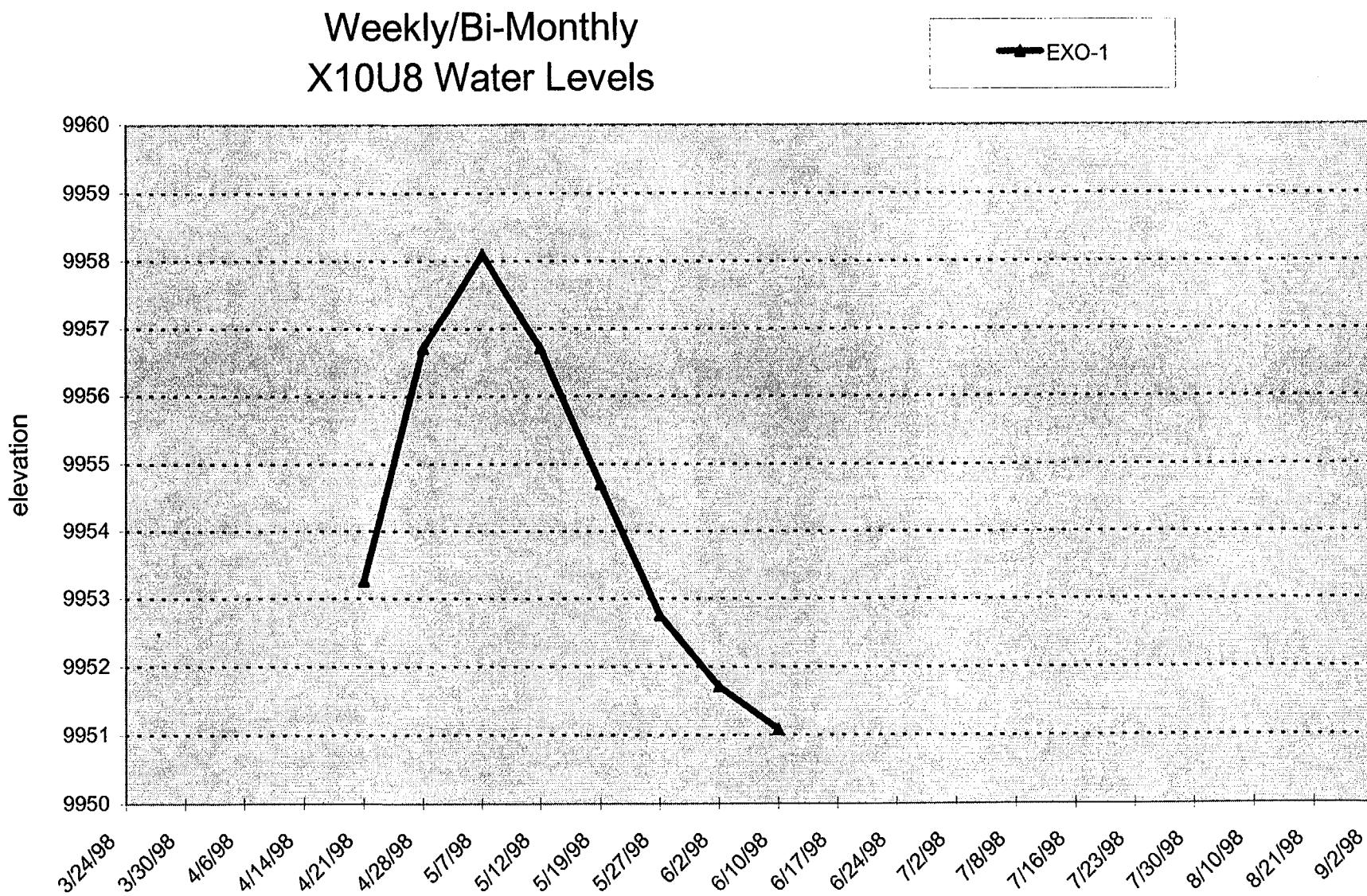


Figure 6-30

Weekly/Bi-Monthly Downgradient Valley Slope Wells

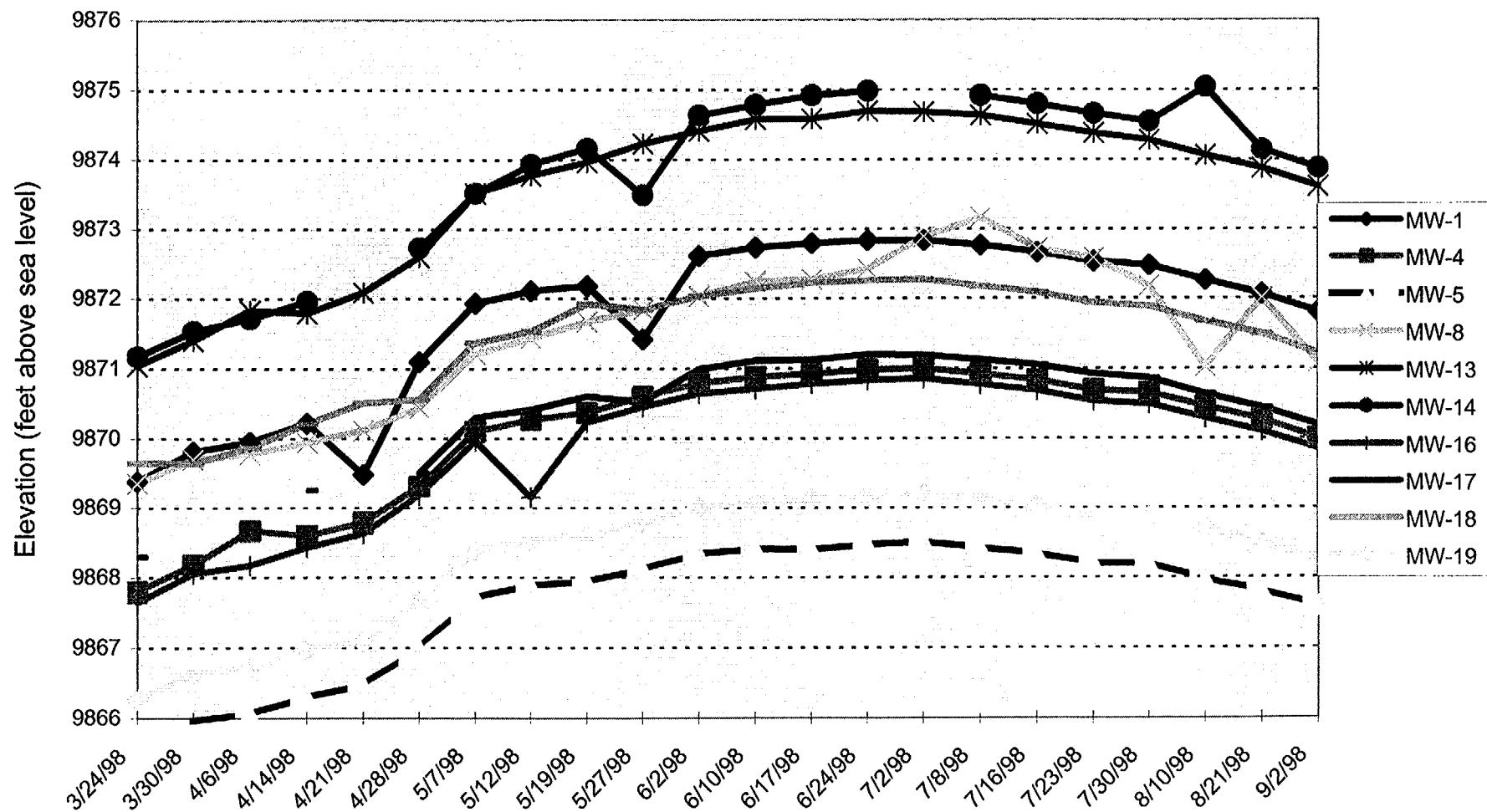


Figure 6-31

Weekly/Bi-Monthly French Gulch Valley Wells

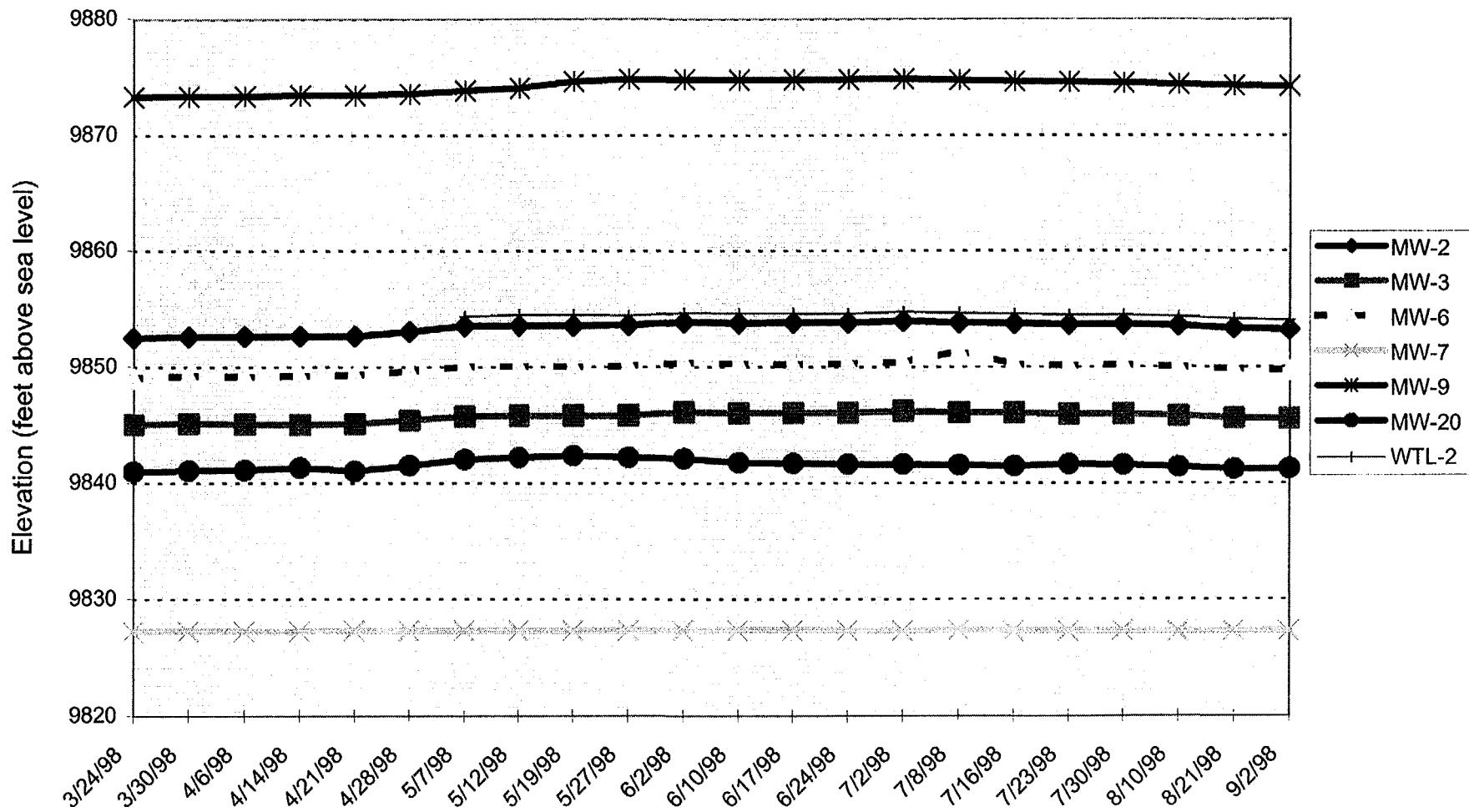


Figure 6-32

Oro Mine Shaft Temperature Monitoring

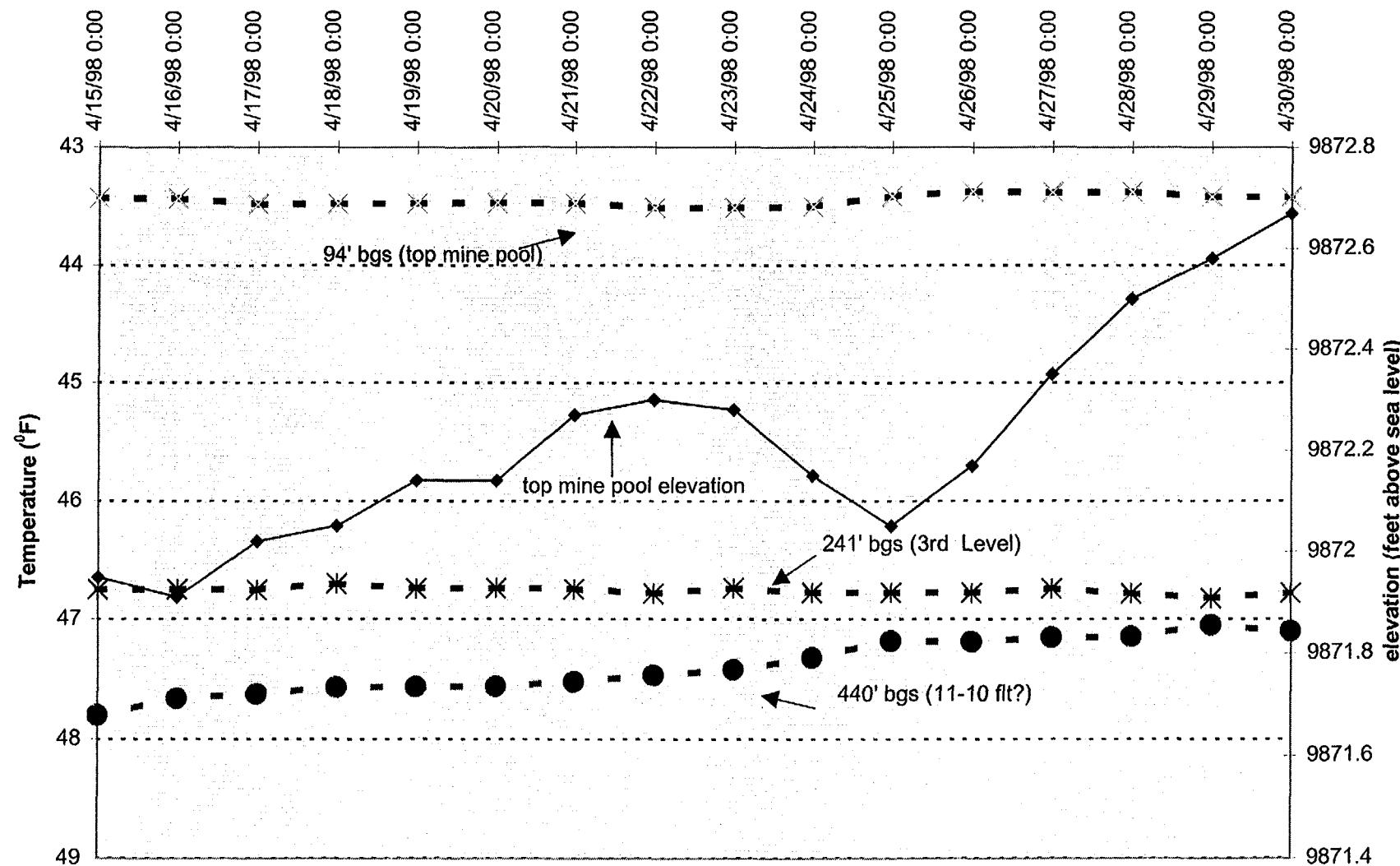


Figure 6-33

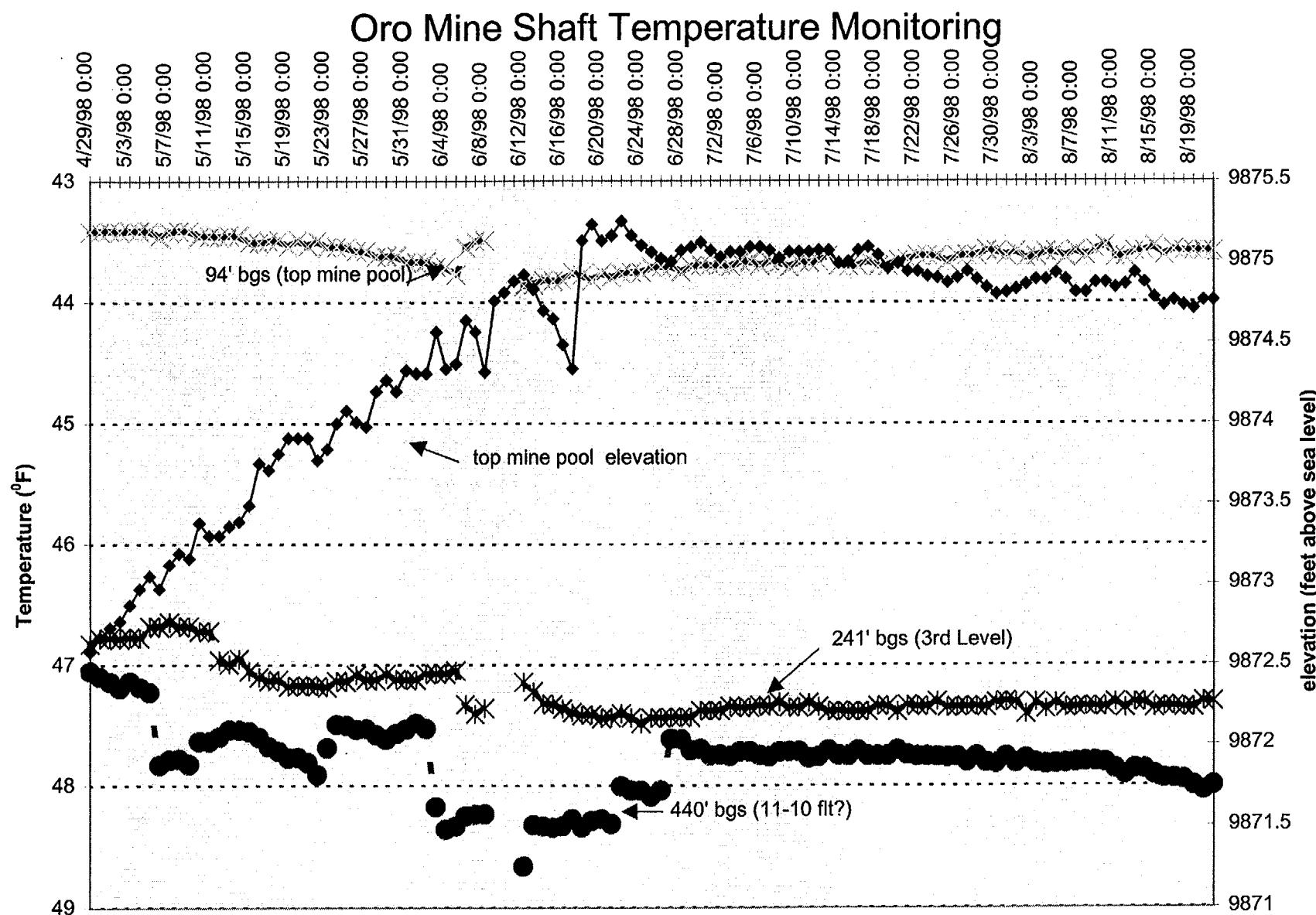


Figure 6-34

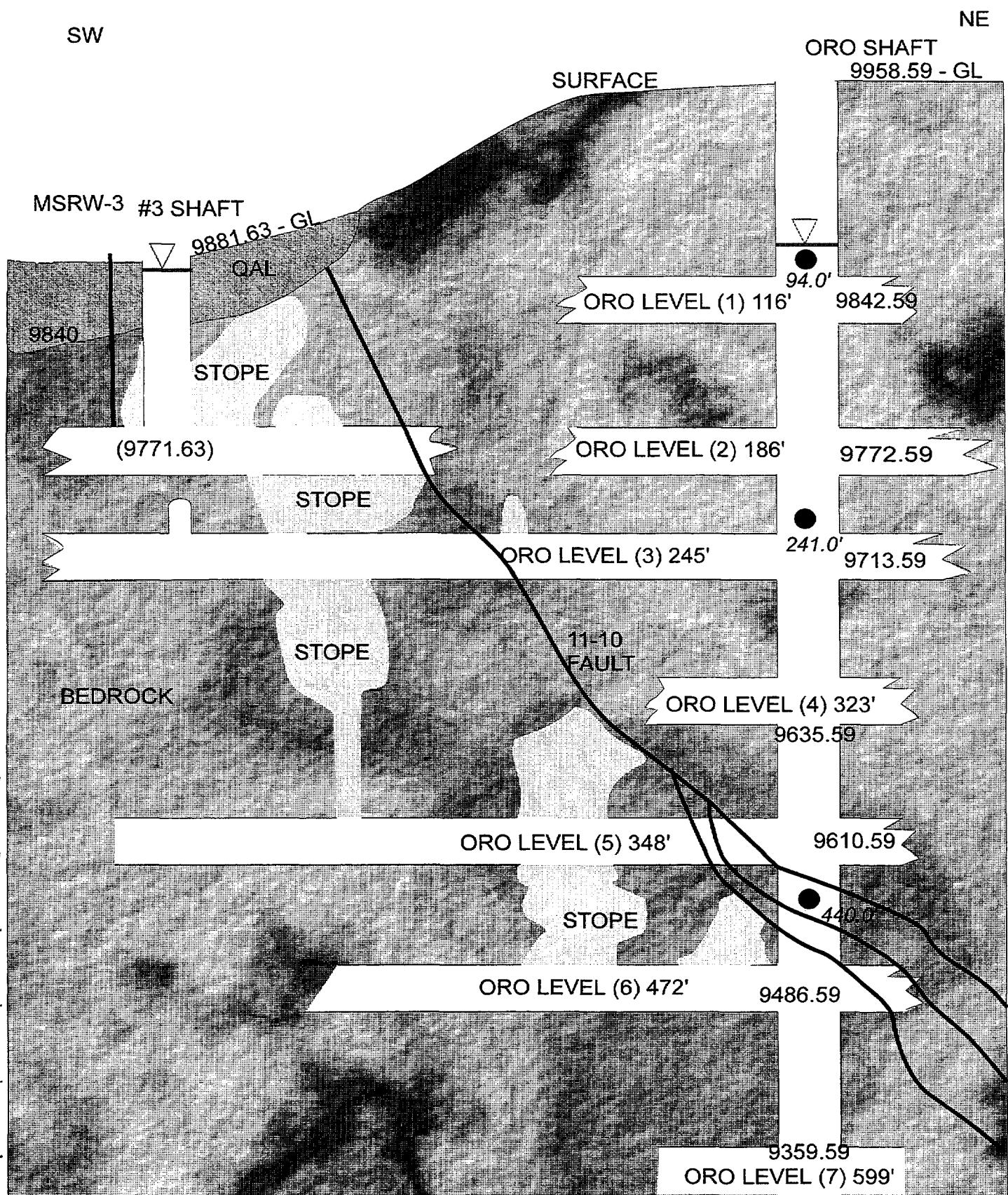


FIGURE 6-35
SCHEMATIC DIAGRAM OF THE ORO SHAFT
 WATER LEVEL AND TEMPERATURE MONITORING 1998

Pressure Transducers and
Thermocouples

DRAFTED BY AMERICAN GEOLOGICAL SERVICES, INC.
AFTER LOVERING (1934)

NOT TO SCALE

French Creek Hydrograph and Dillon Reservoir Climatic Data Spring/Summer 1997

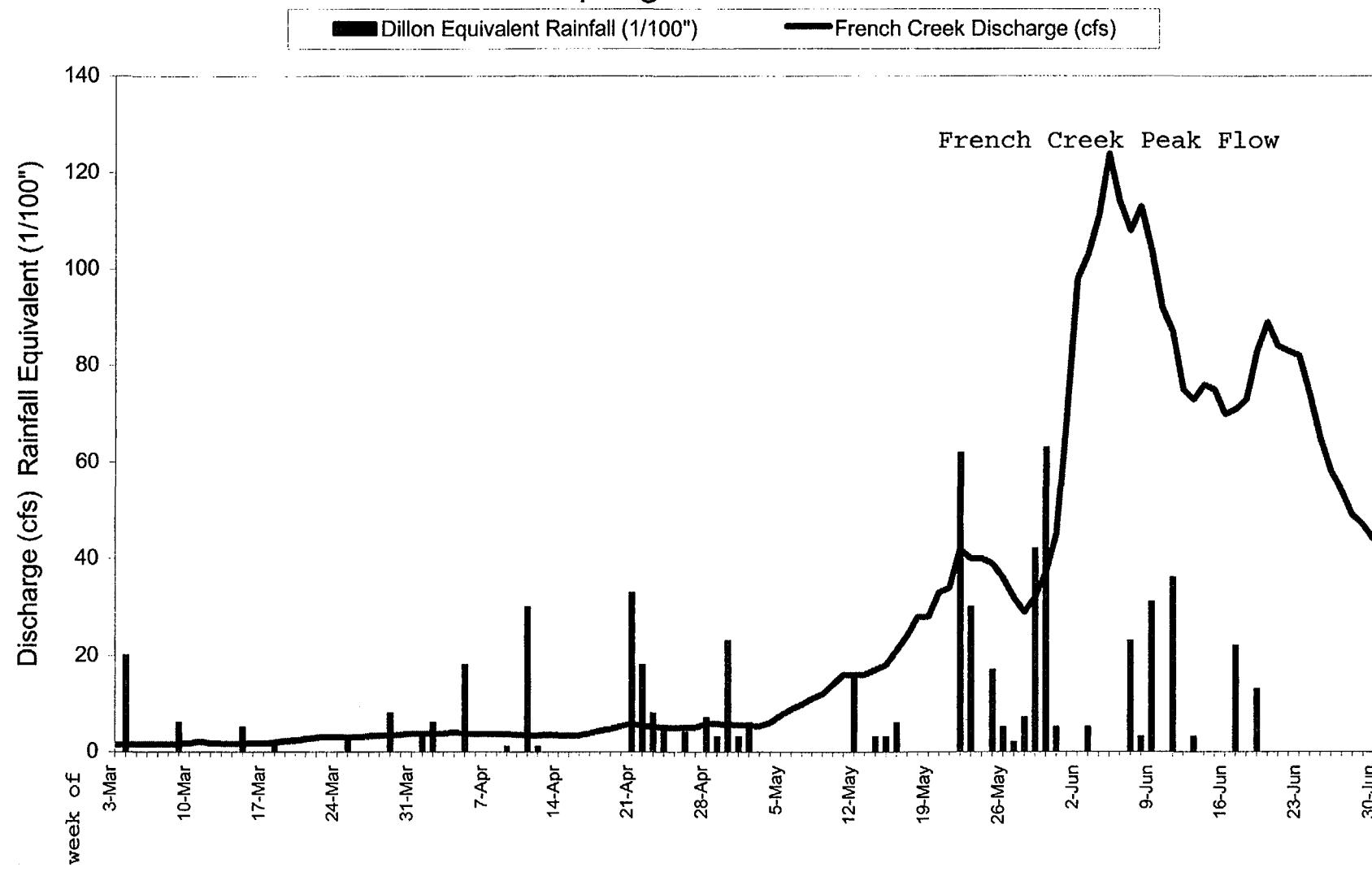


Figure 6-36

French Creek Hydrograph May 1997 Storm Event

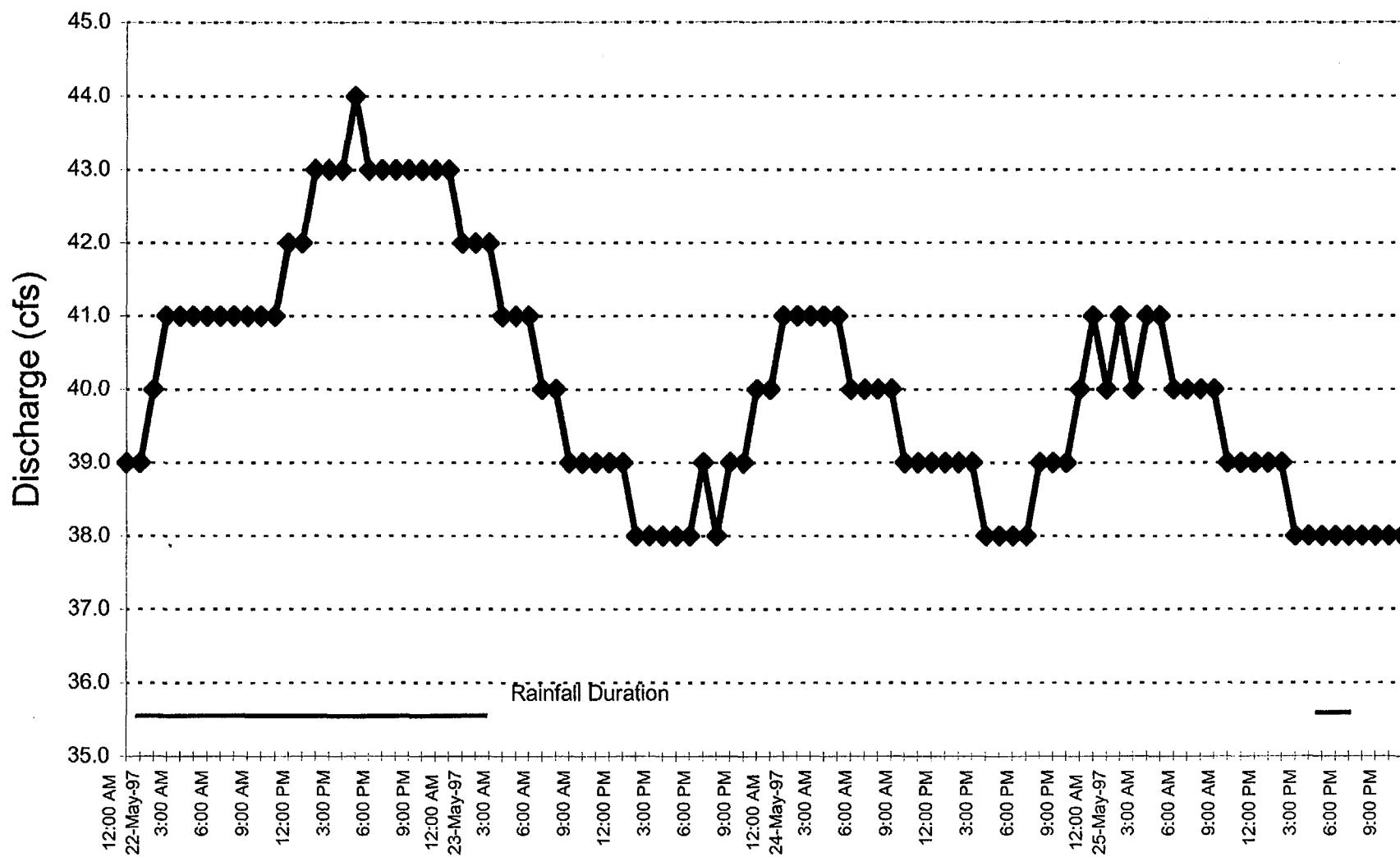


Figure 6-37

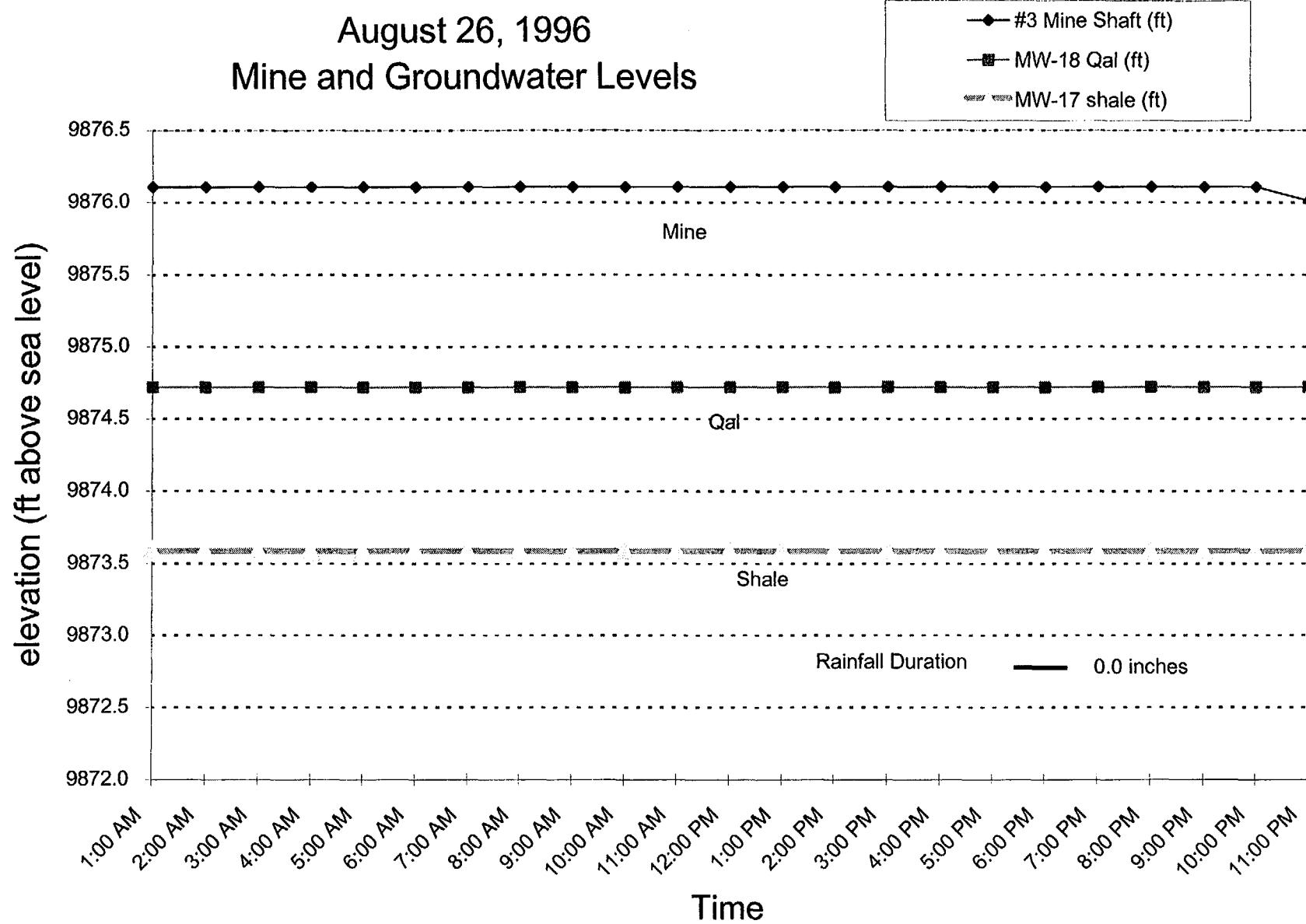


Figure 6-38

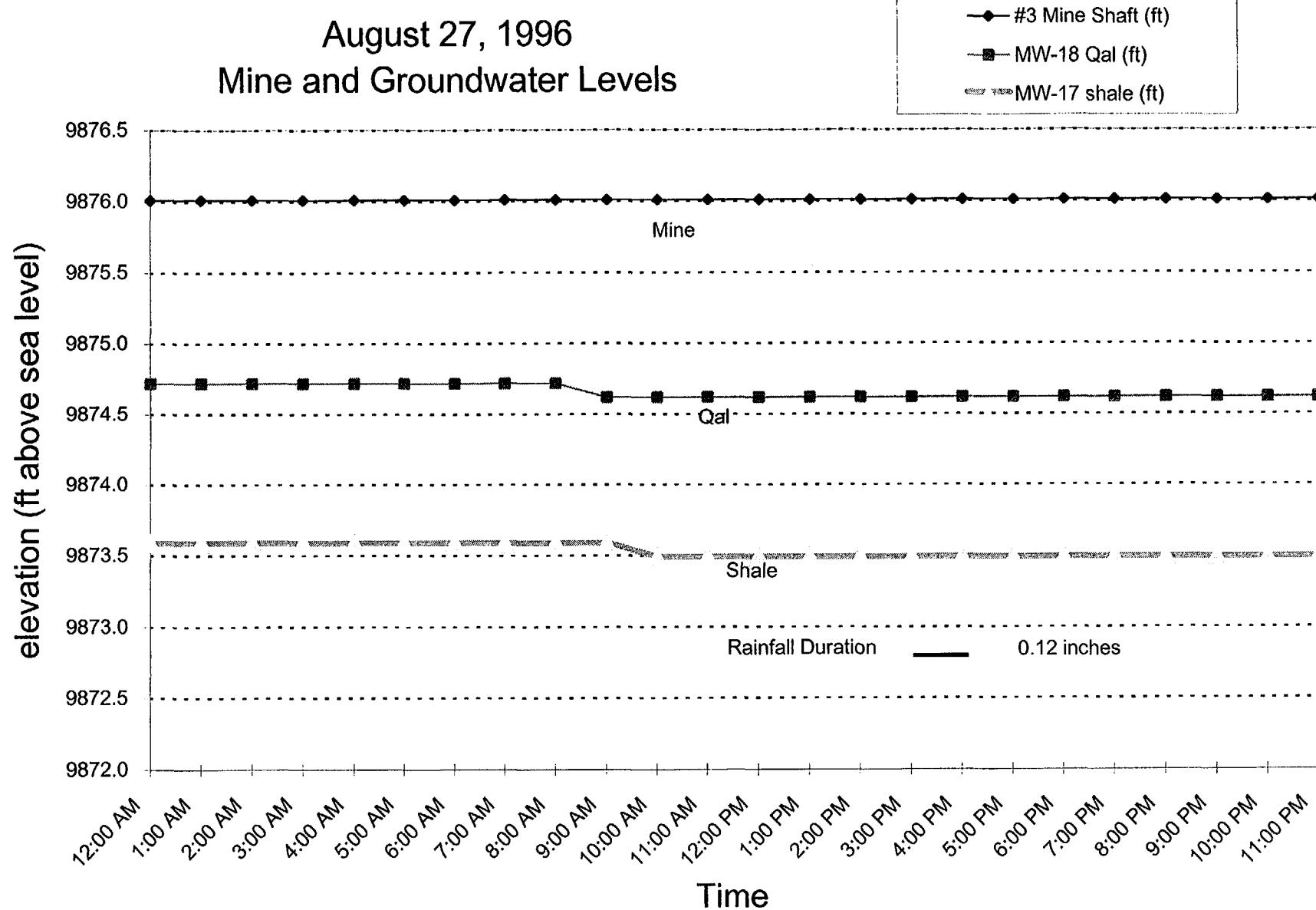


Figure 6-39

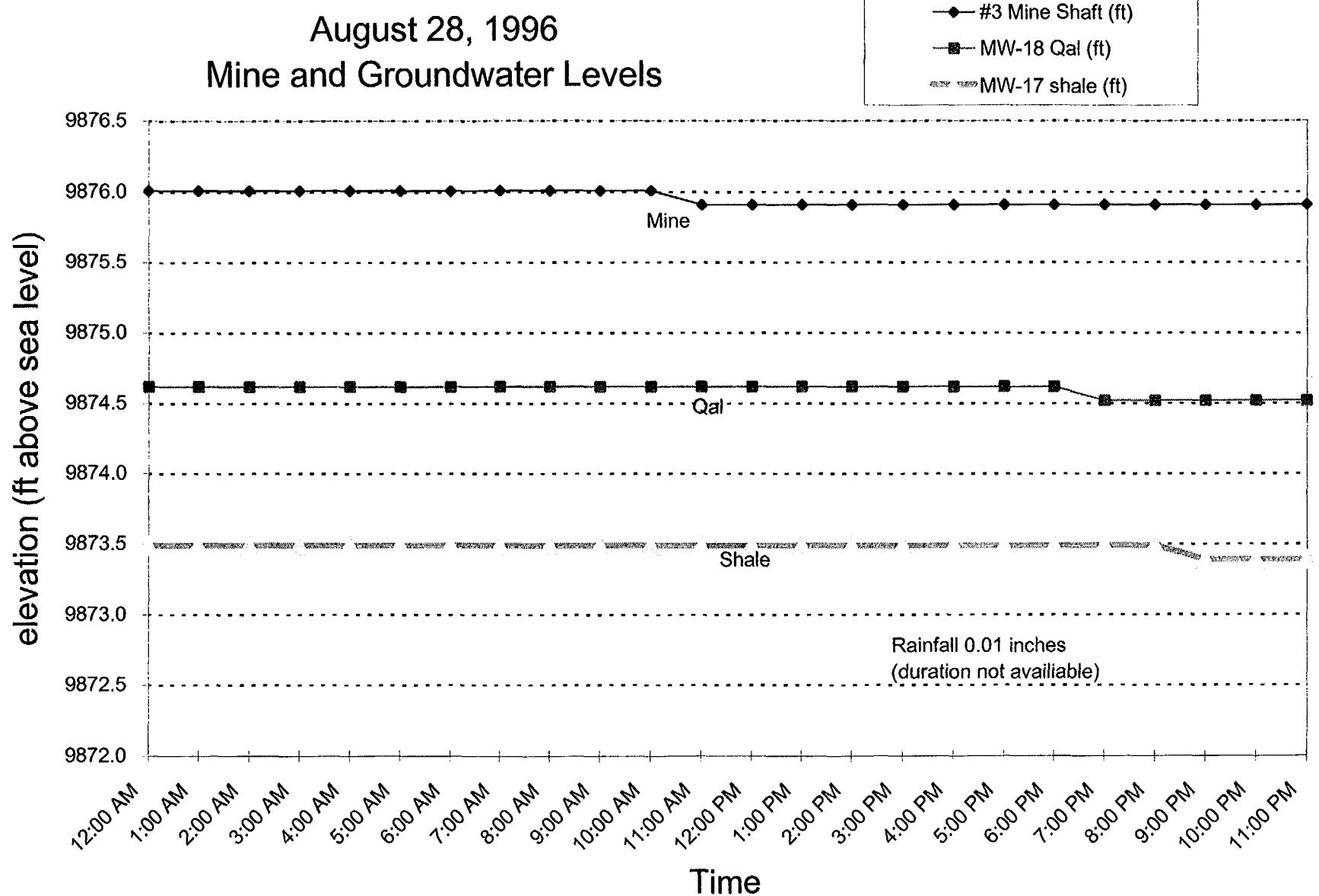


Figure 6-40

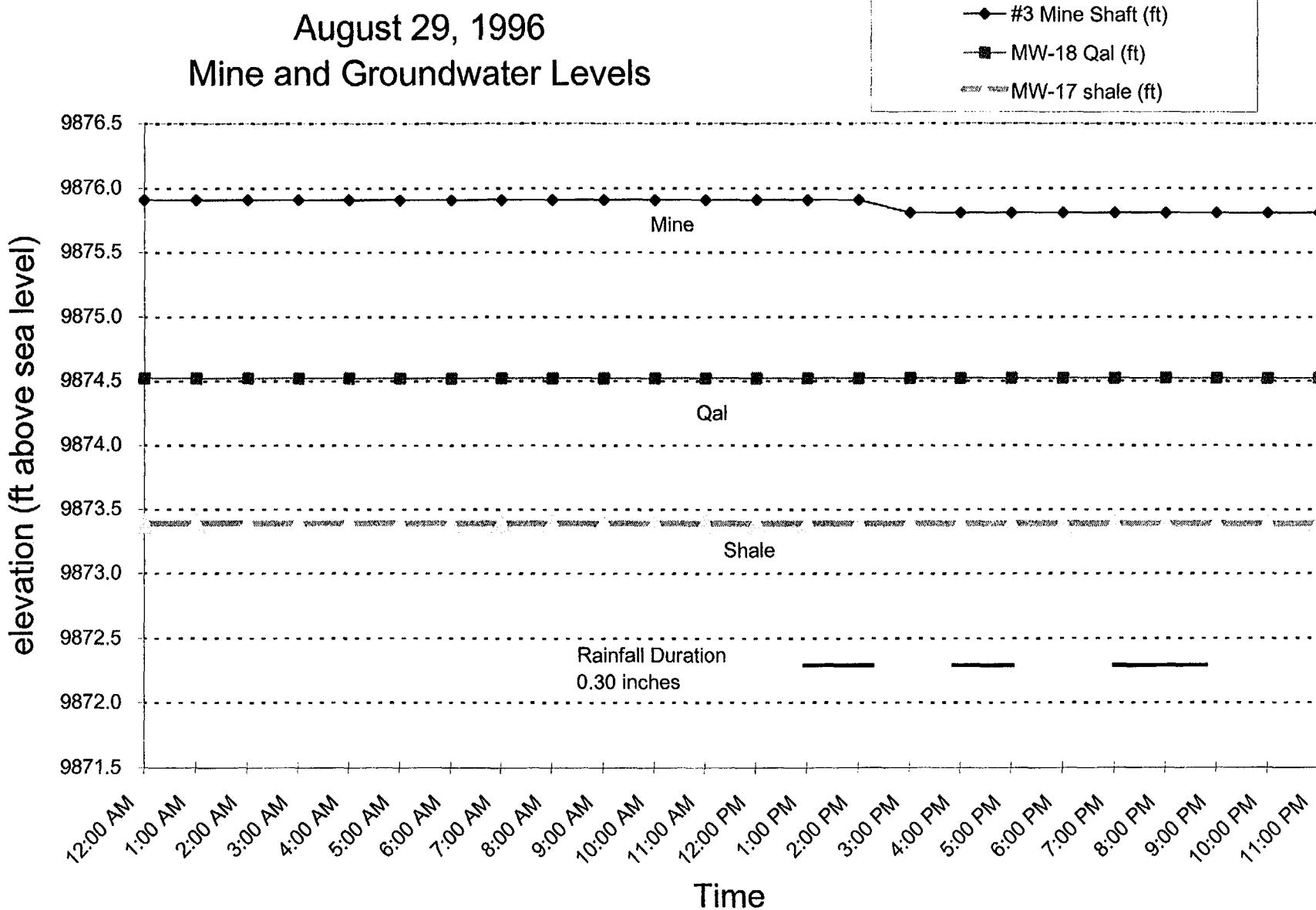


Figure 6-41

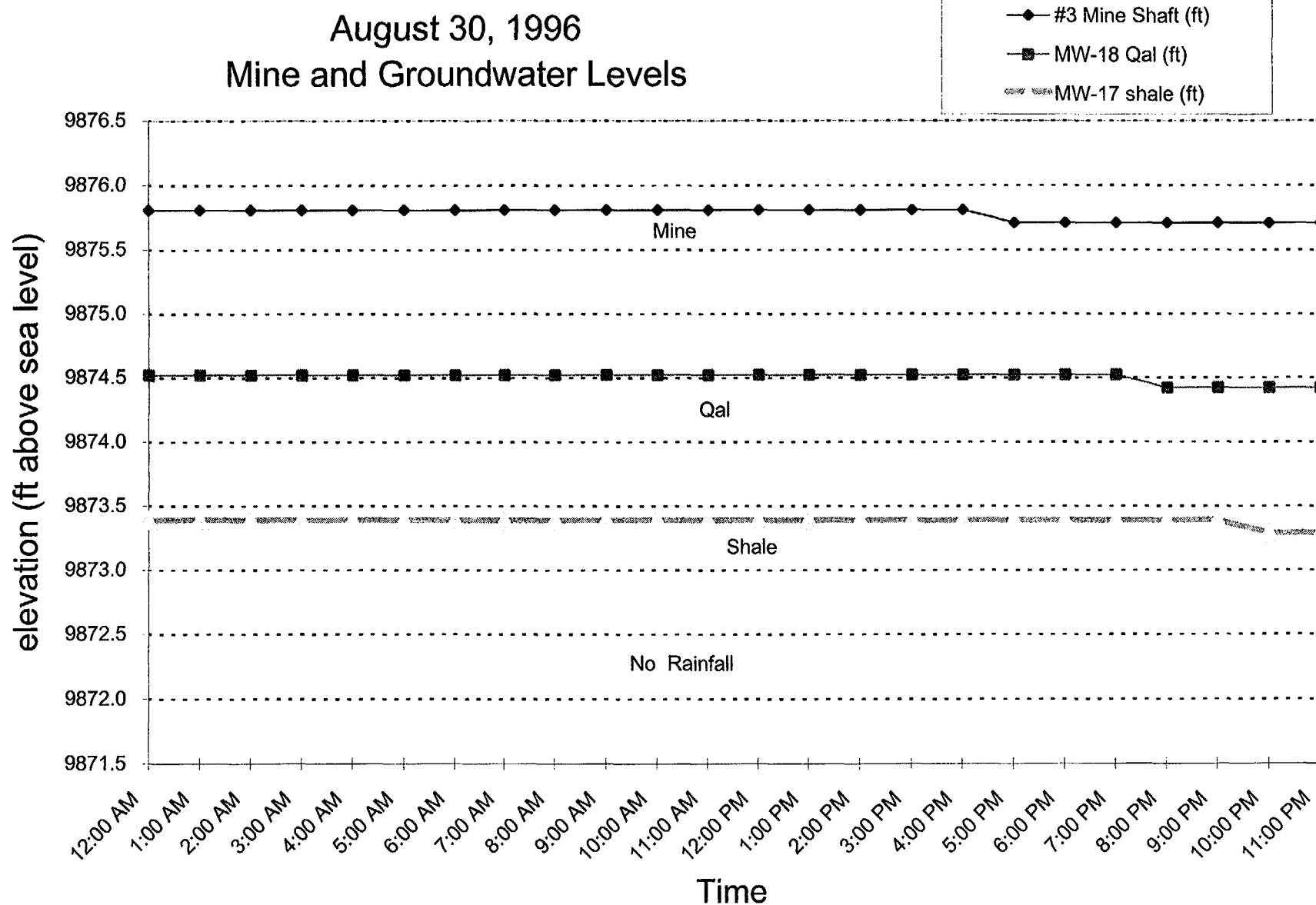


Figure 6-42a

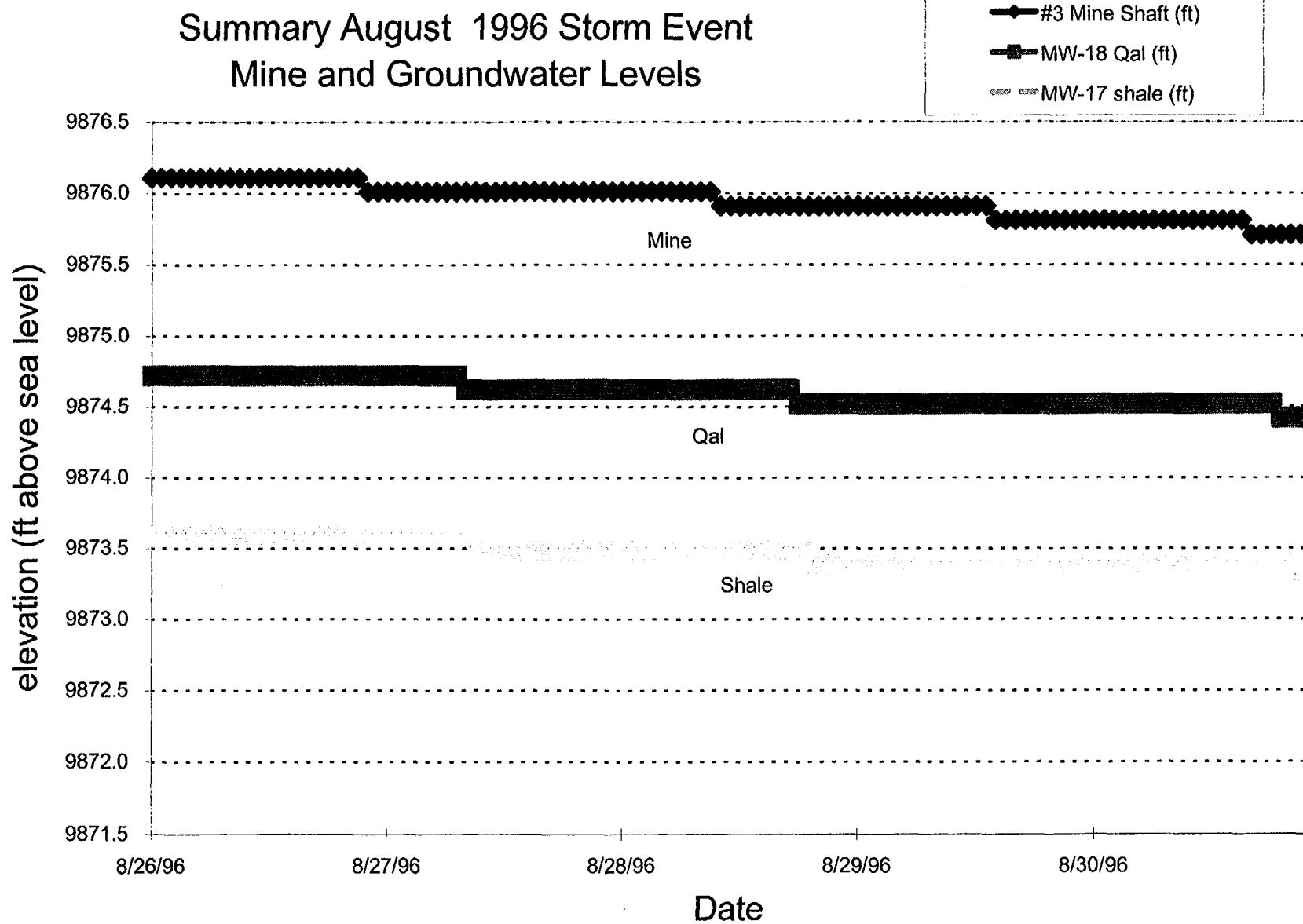


Figure 6-42b

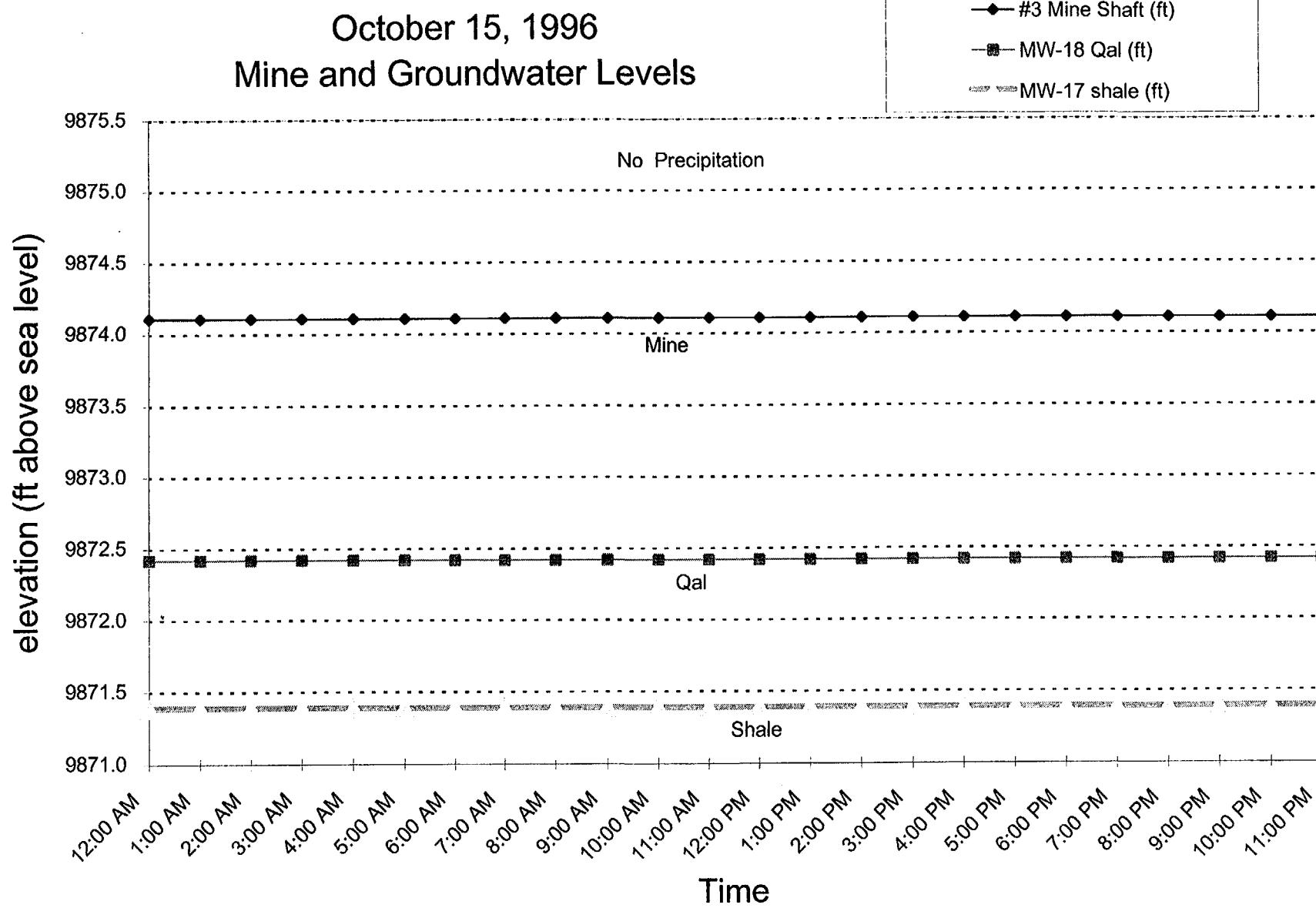


Figure 6-43

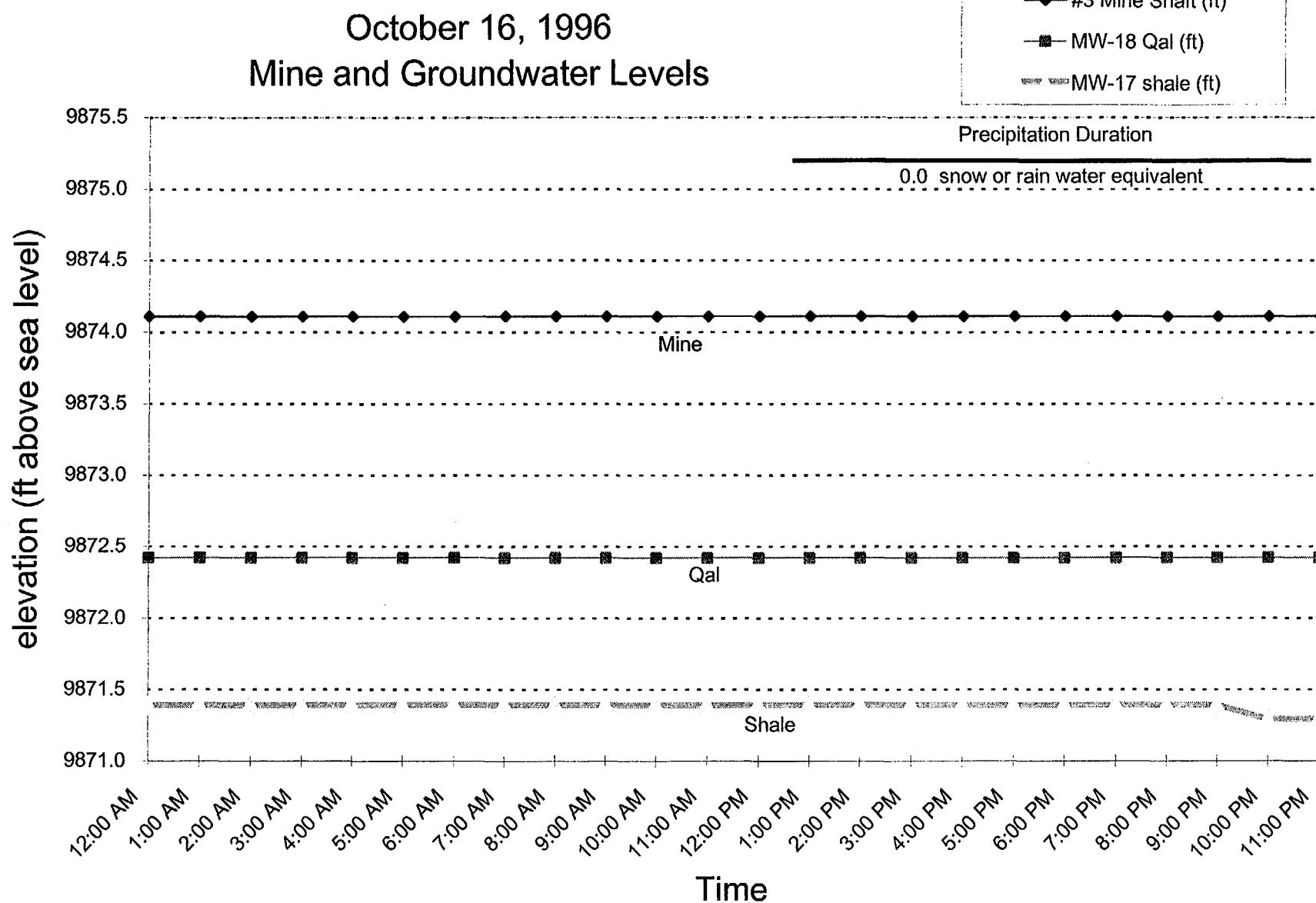


Figure 6-44

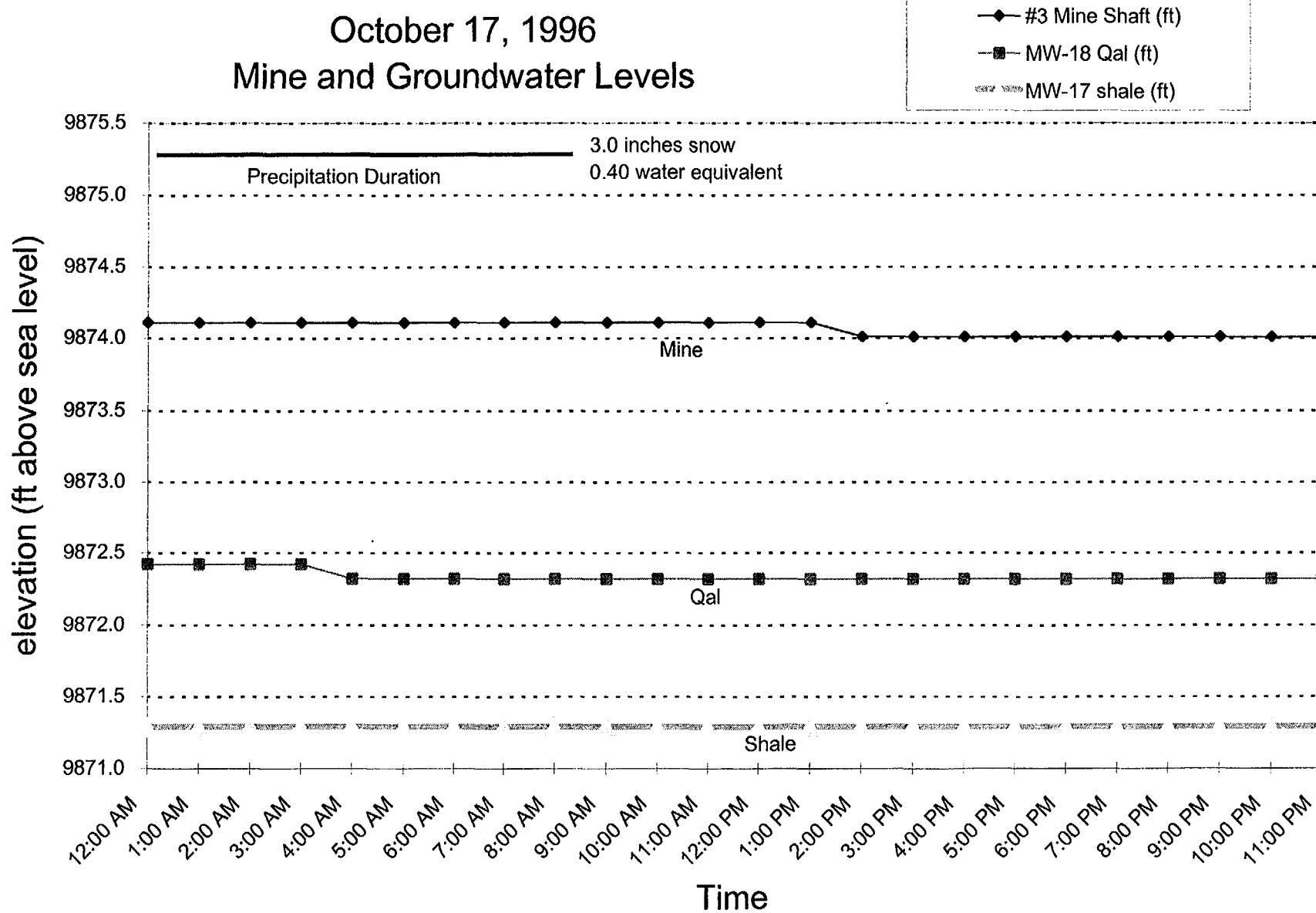


Figure 6-45

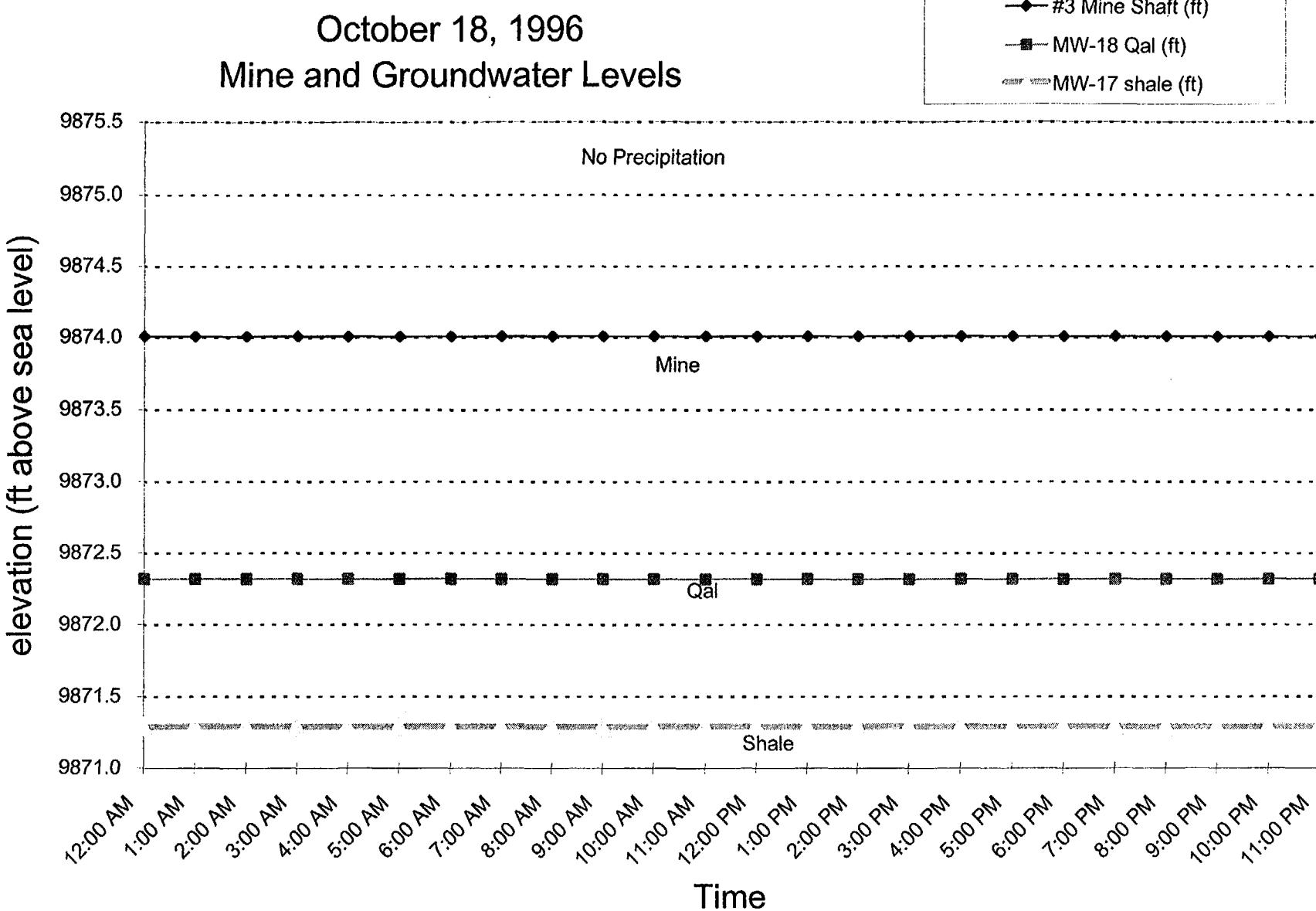


Figure 6-46

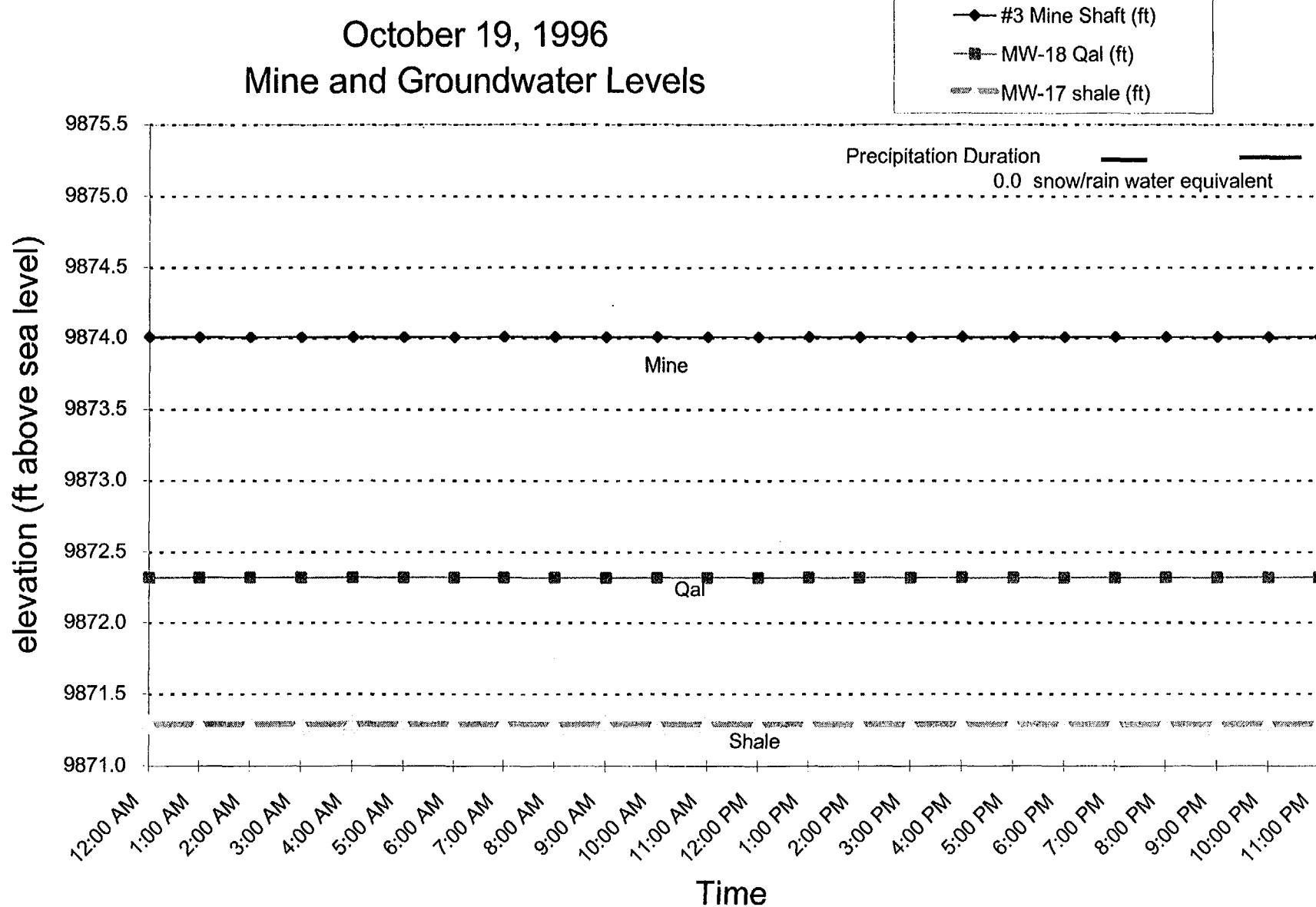


Figure 6-47a

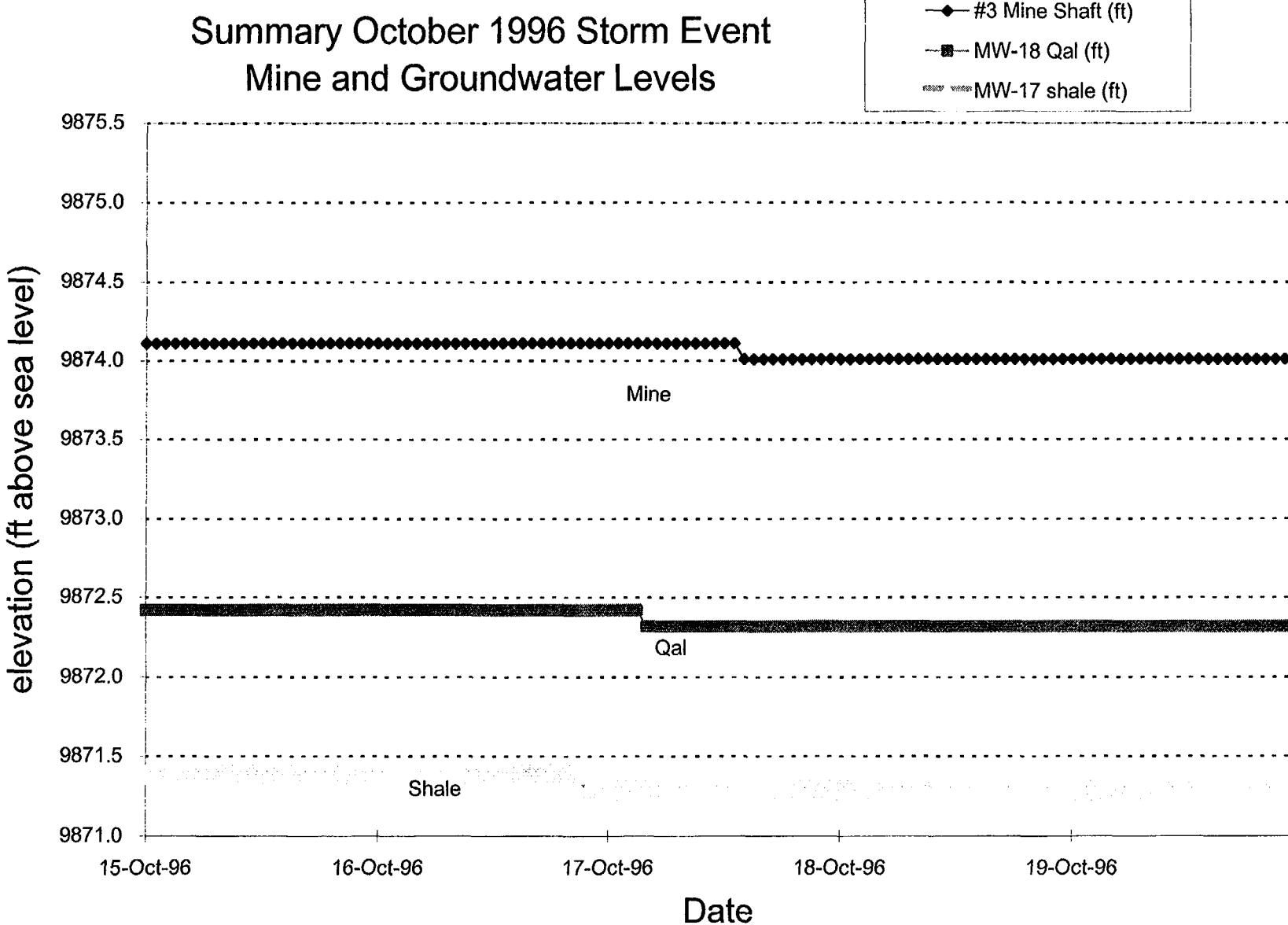


Figure 6-47b

1996 Mine and Groundwater
Falling Limb Hydrograph
Wellington-Oro Mine Site

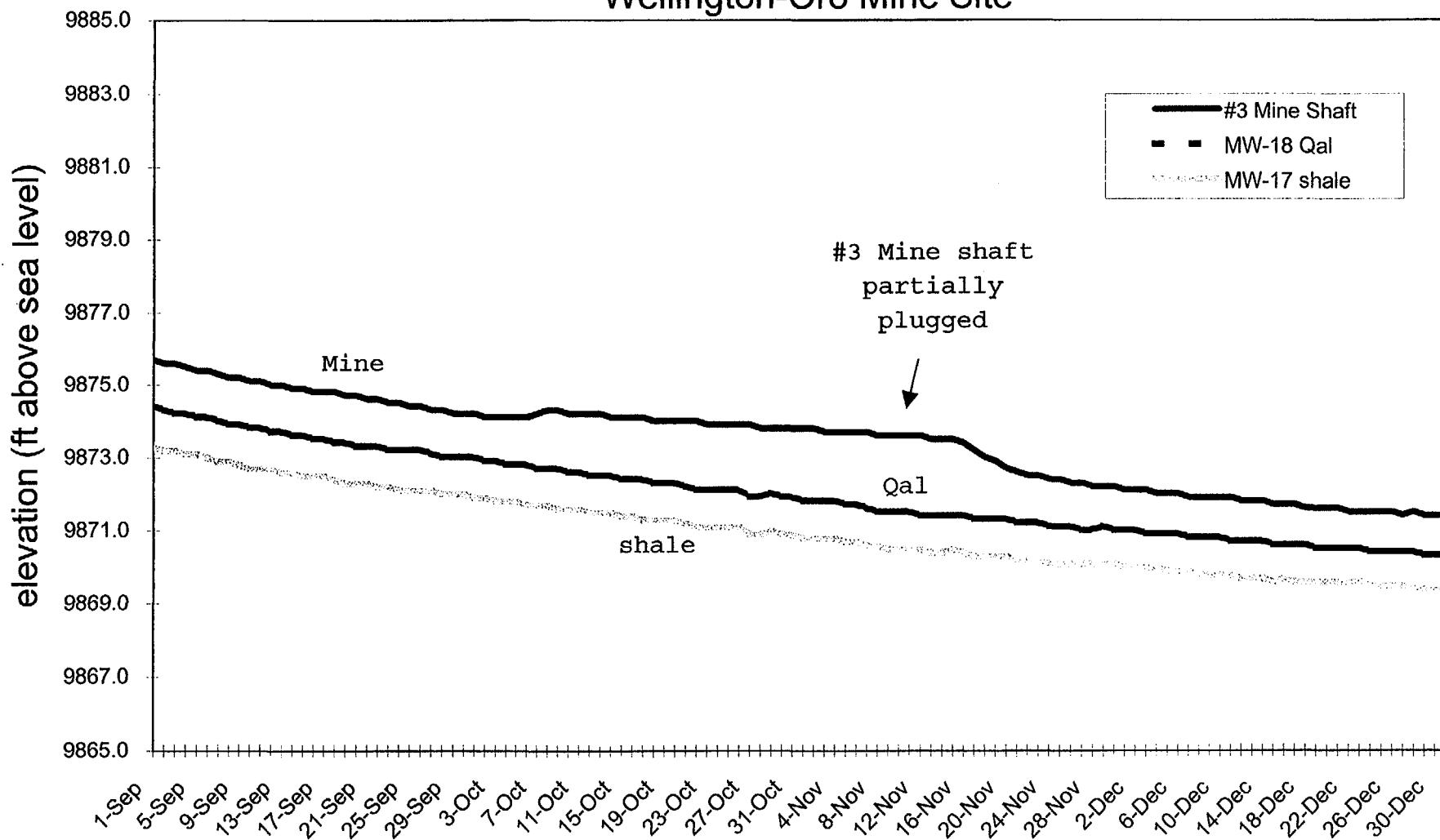


Figure 6-48

1997 Stream, Mine and Groundwater Rising Limb Hydrograph

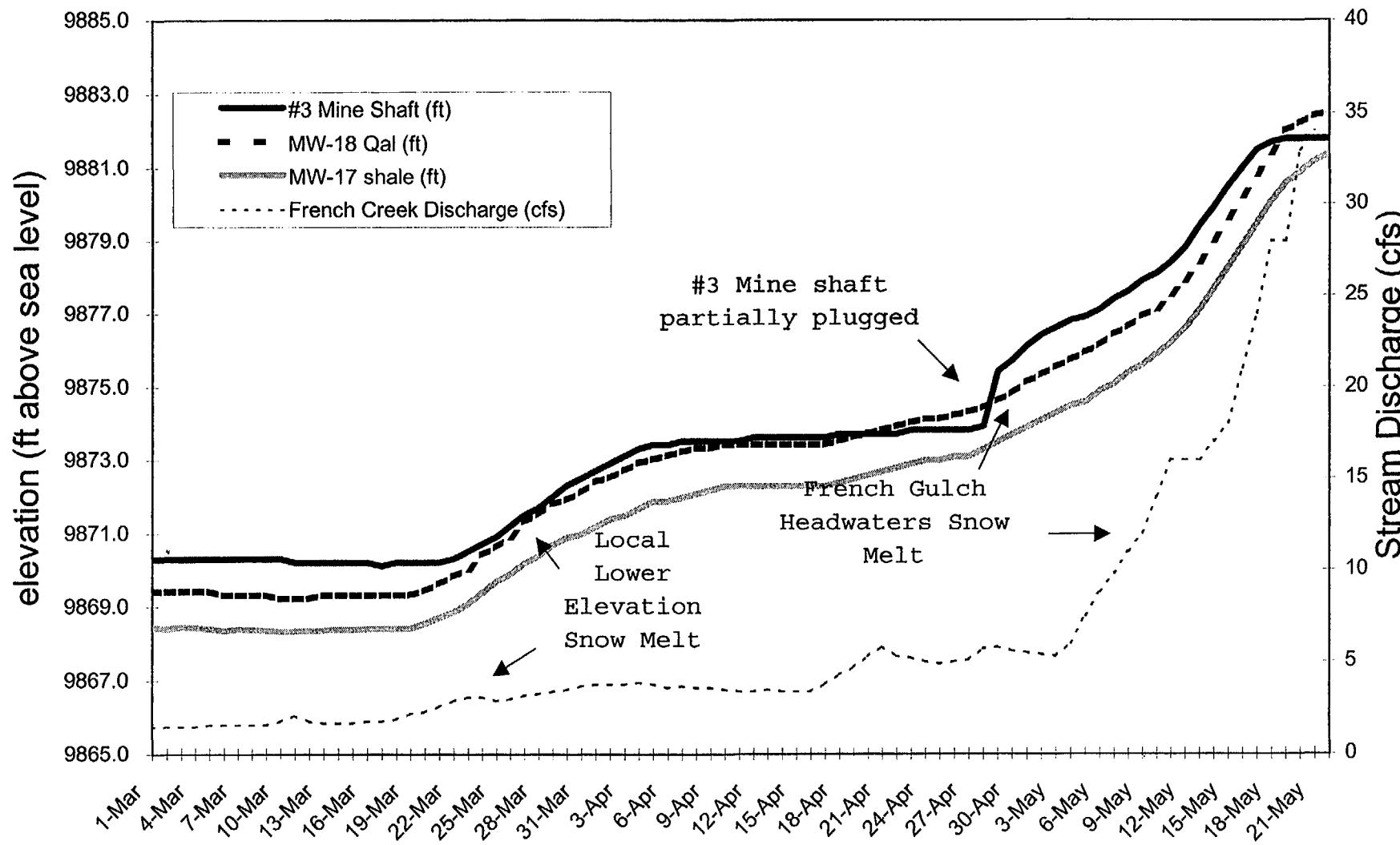


Figure 6-49

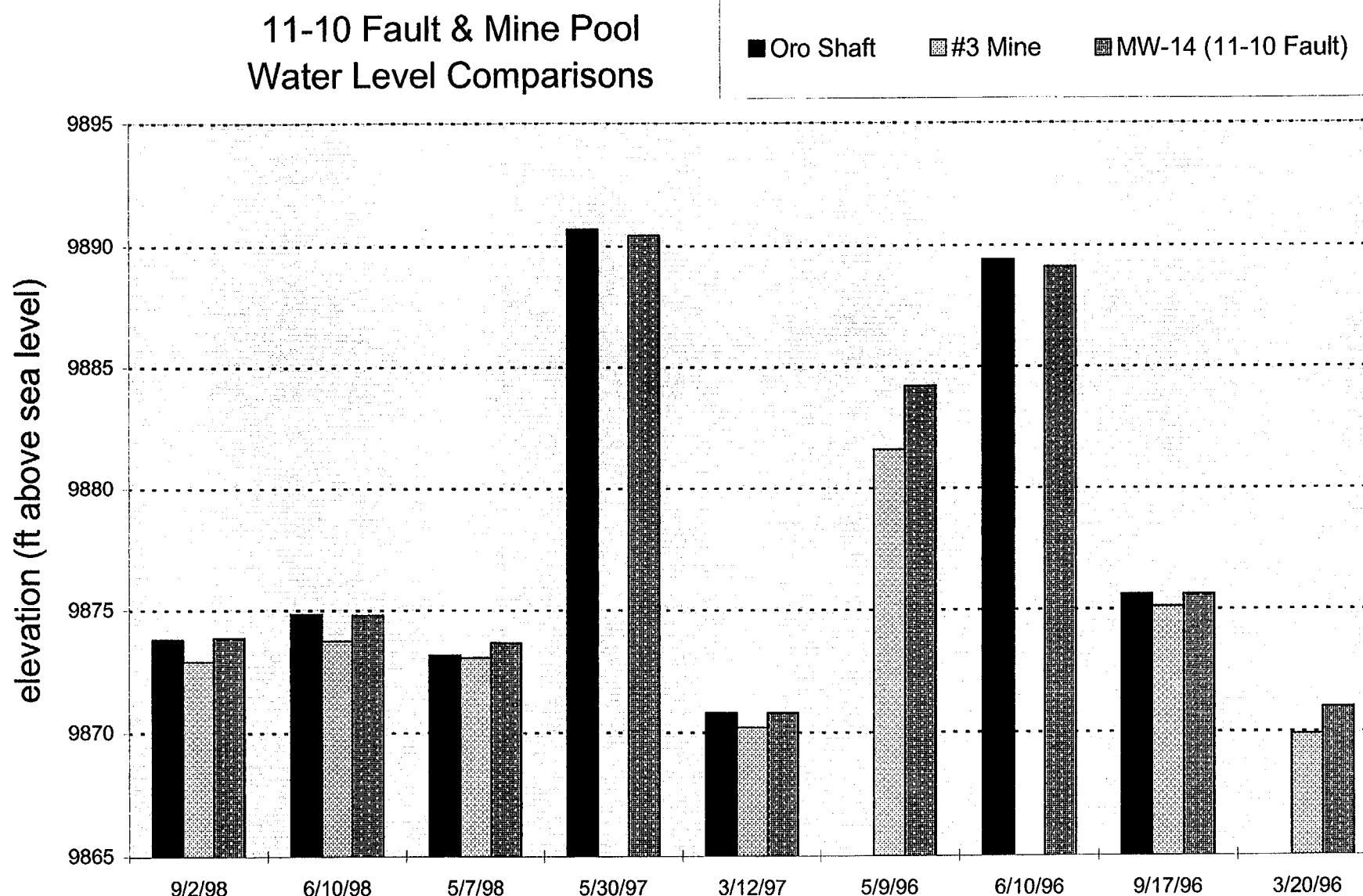
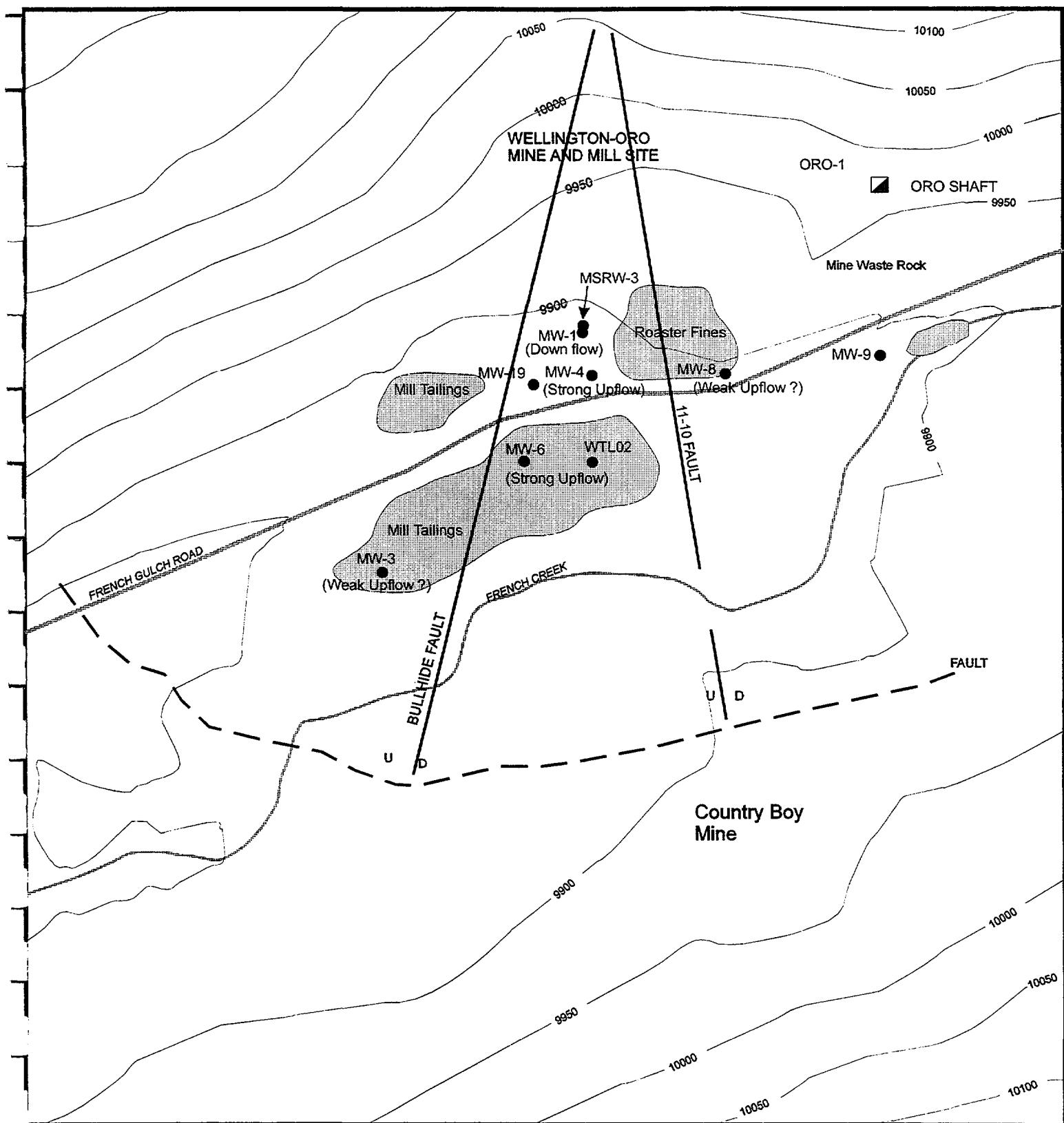
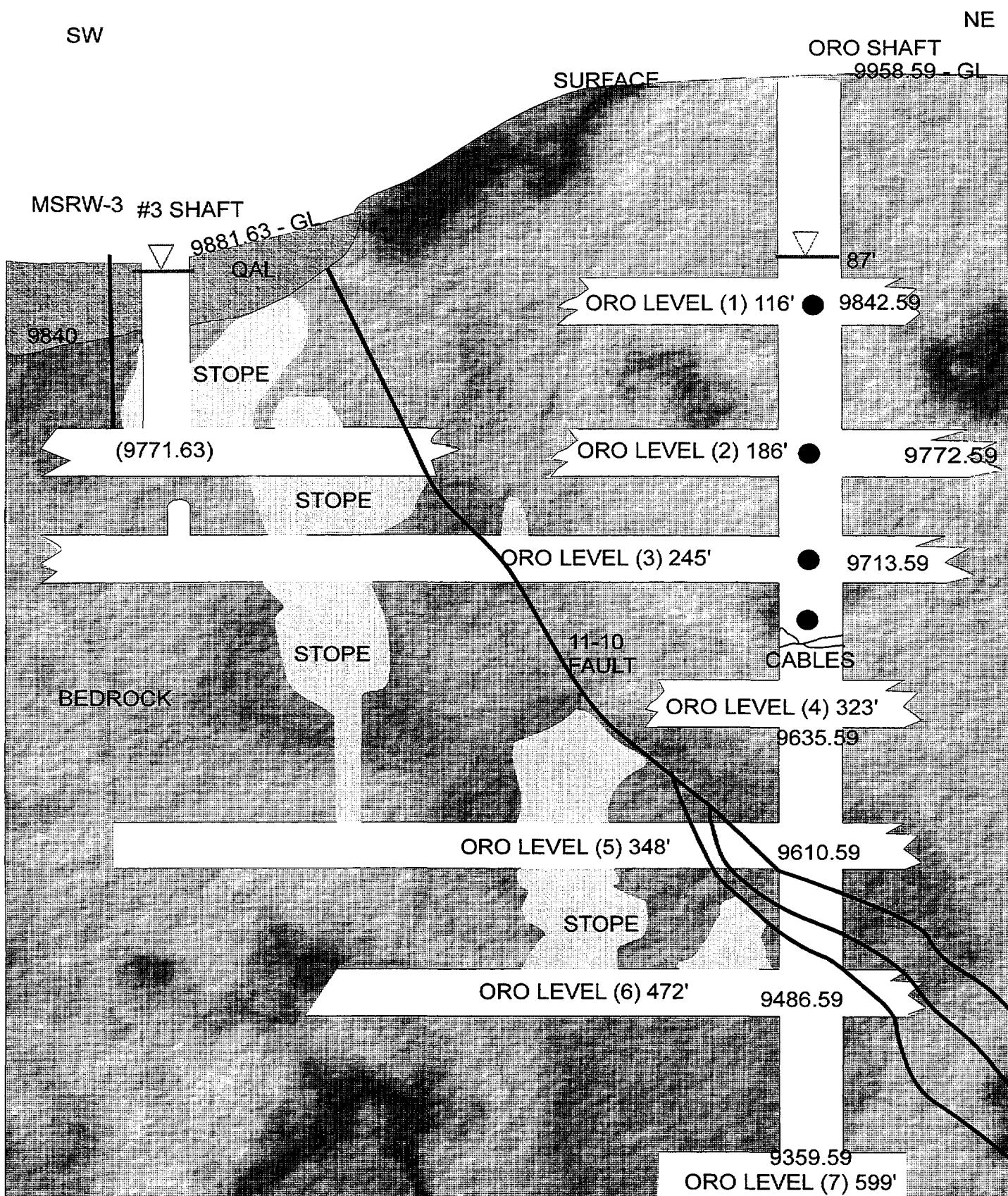


Figure 6-50



**LOCATION MAP FOR HEAT PULSE
FLOWMETER WELLS LOW FLOW
CONDITIONS, JANUARY 1997**

Figure 7-1



Low Flow January 1997

SCHEMATIC DIAGRAM OF THE ORO SHAFT

DEPTH MEASURED FROM ORO SURFACE
DRAFTED BY AMERICAN GEOLOGICAL SERVICES, INC
AFTER LOVERING (1934)

● Sample Locations
NOT TO SCALE

Figure 7-2

Flow Histogram January 1997: MW-19

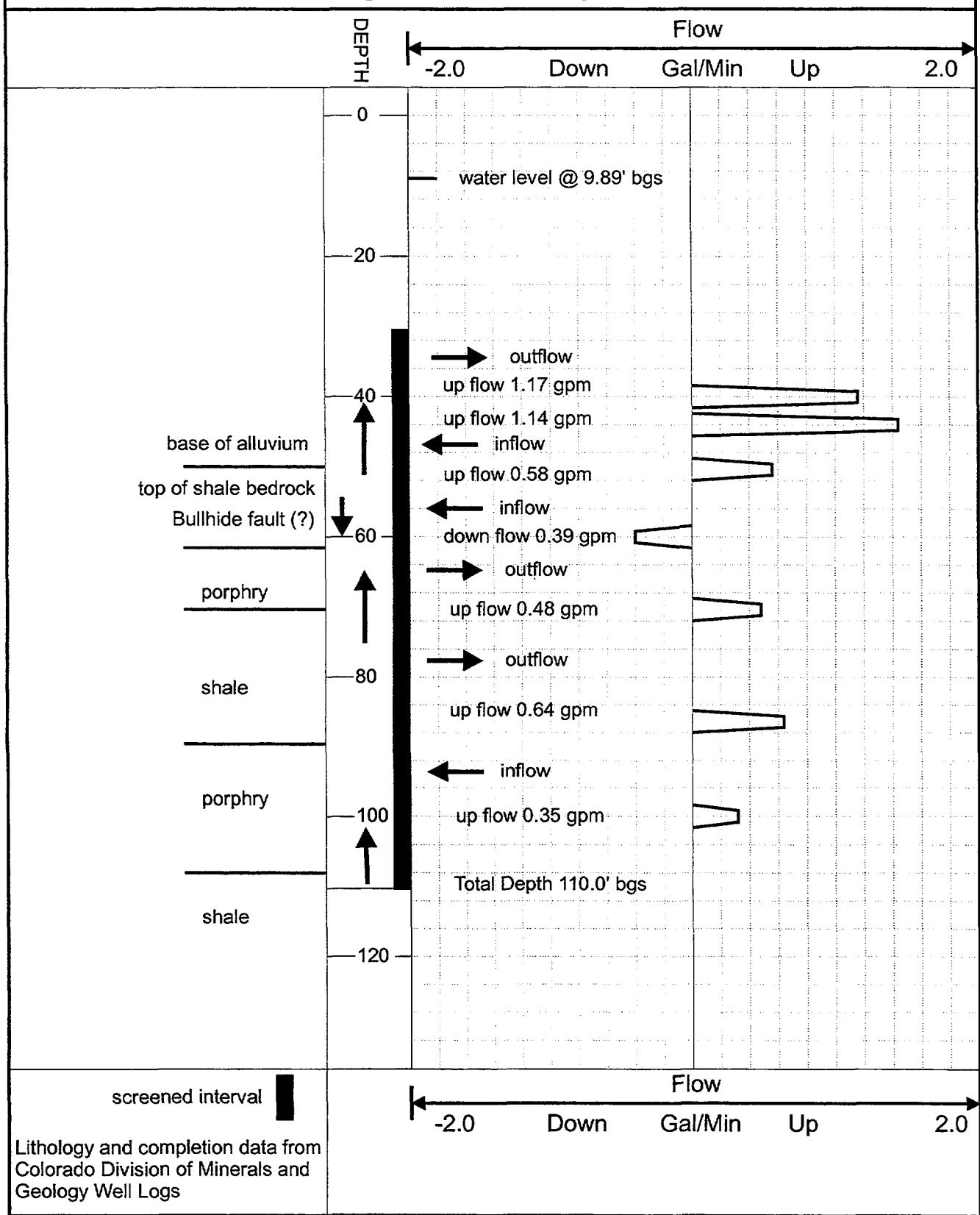


Figure 7-3

Flow Histogram January 1997: MW-6

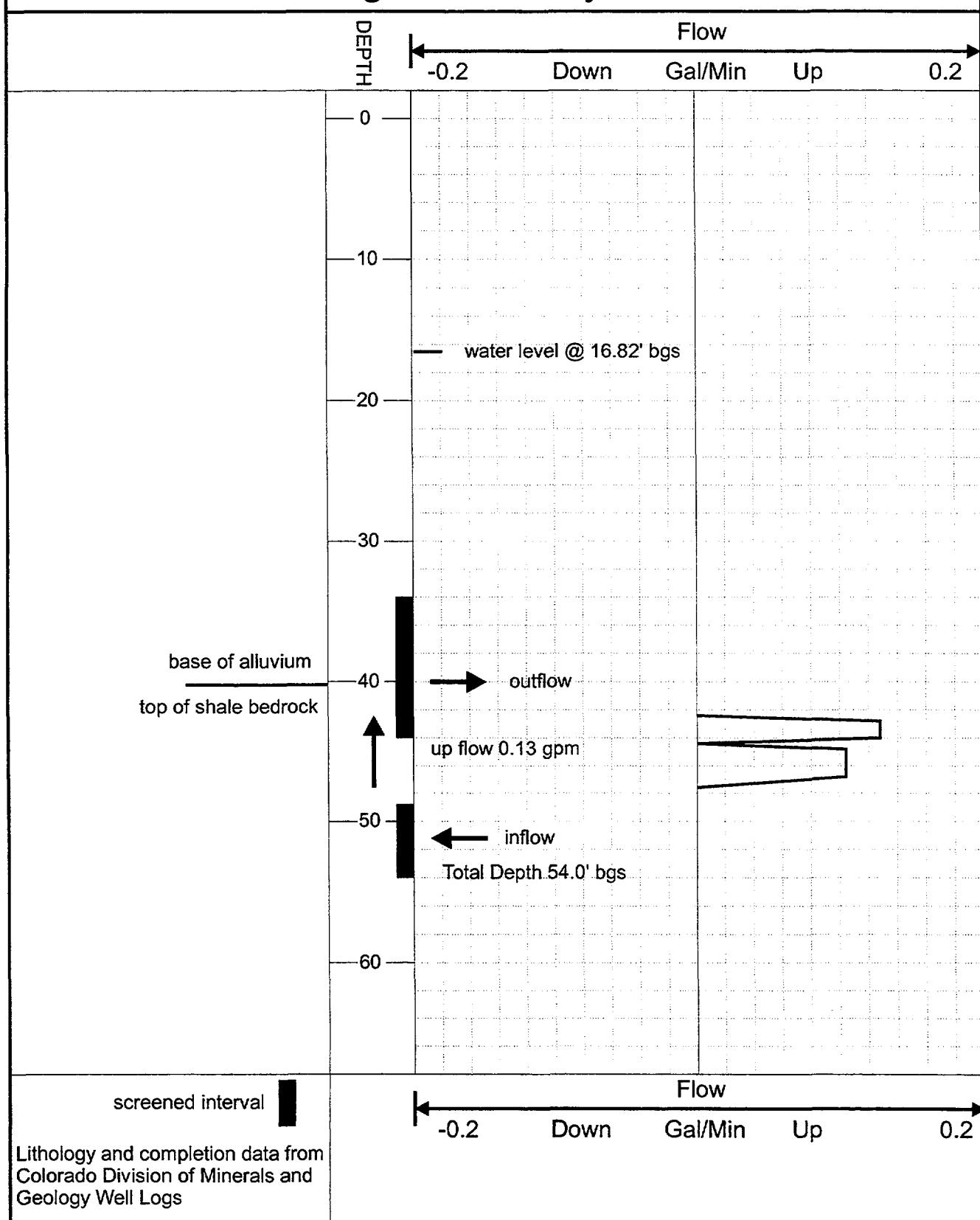


Figure 7-4

Flow Histogram January 1997: MW-4

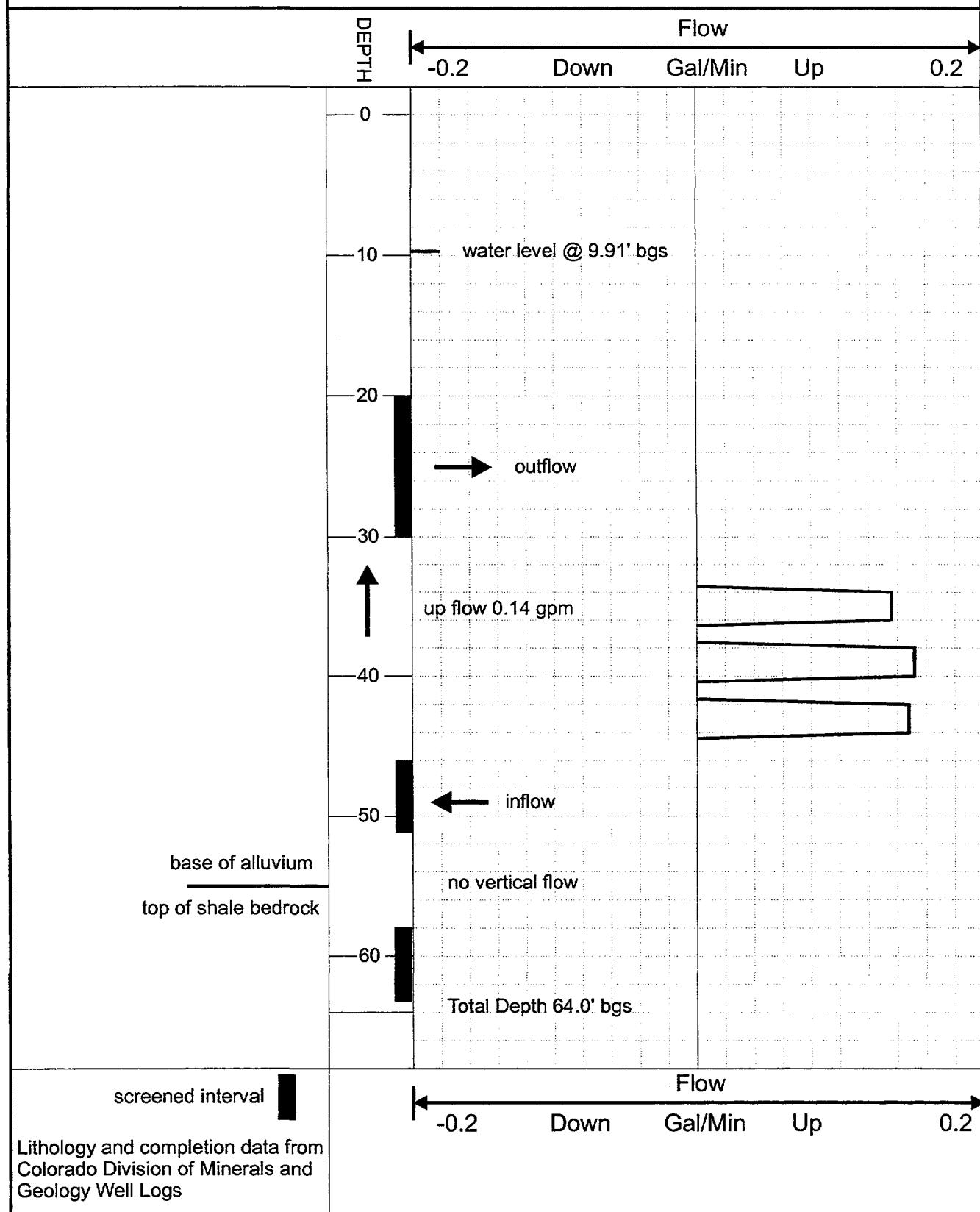
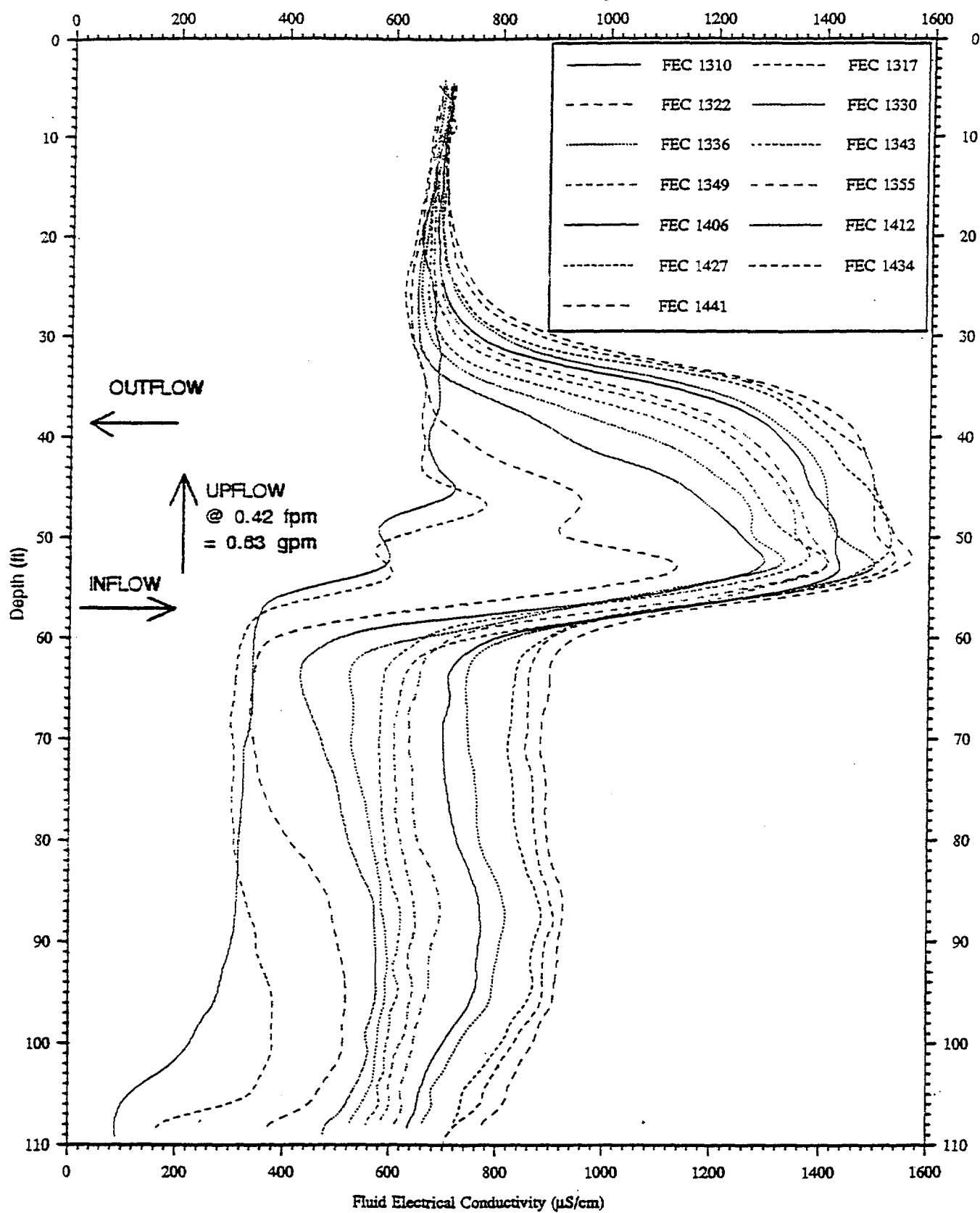


Figure 7-5

MW-19 Hydrophysical Logs for Ambient Flow Characterization, May 1996



From RAS, 1997a

Figure 7-7

Flow Histogram January 1997: MW-1

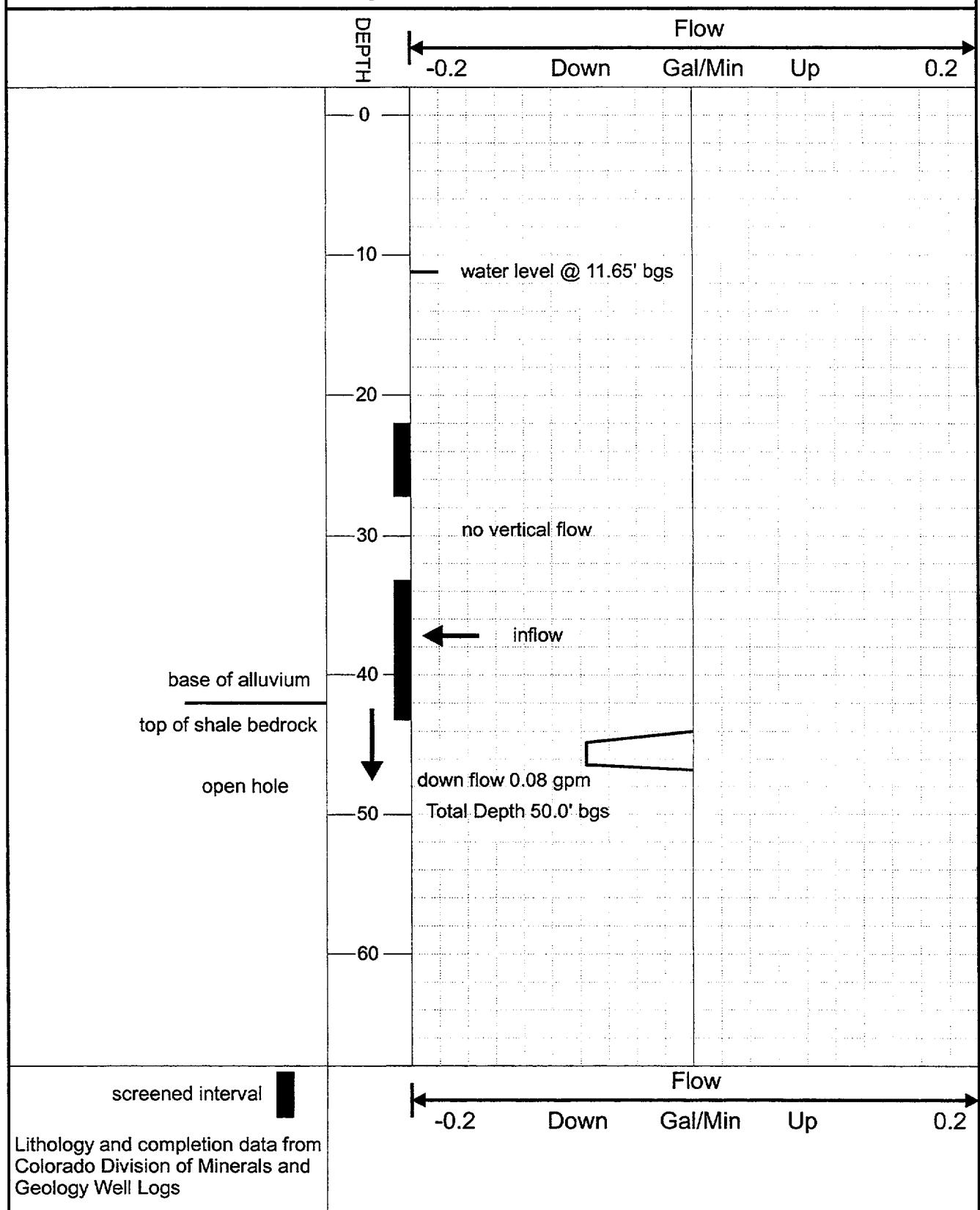


Figure 7-6

Flow Histogram January 1997: MW-3

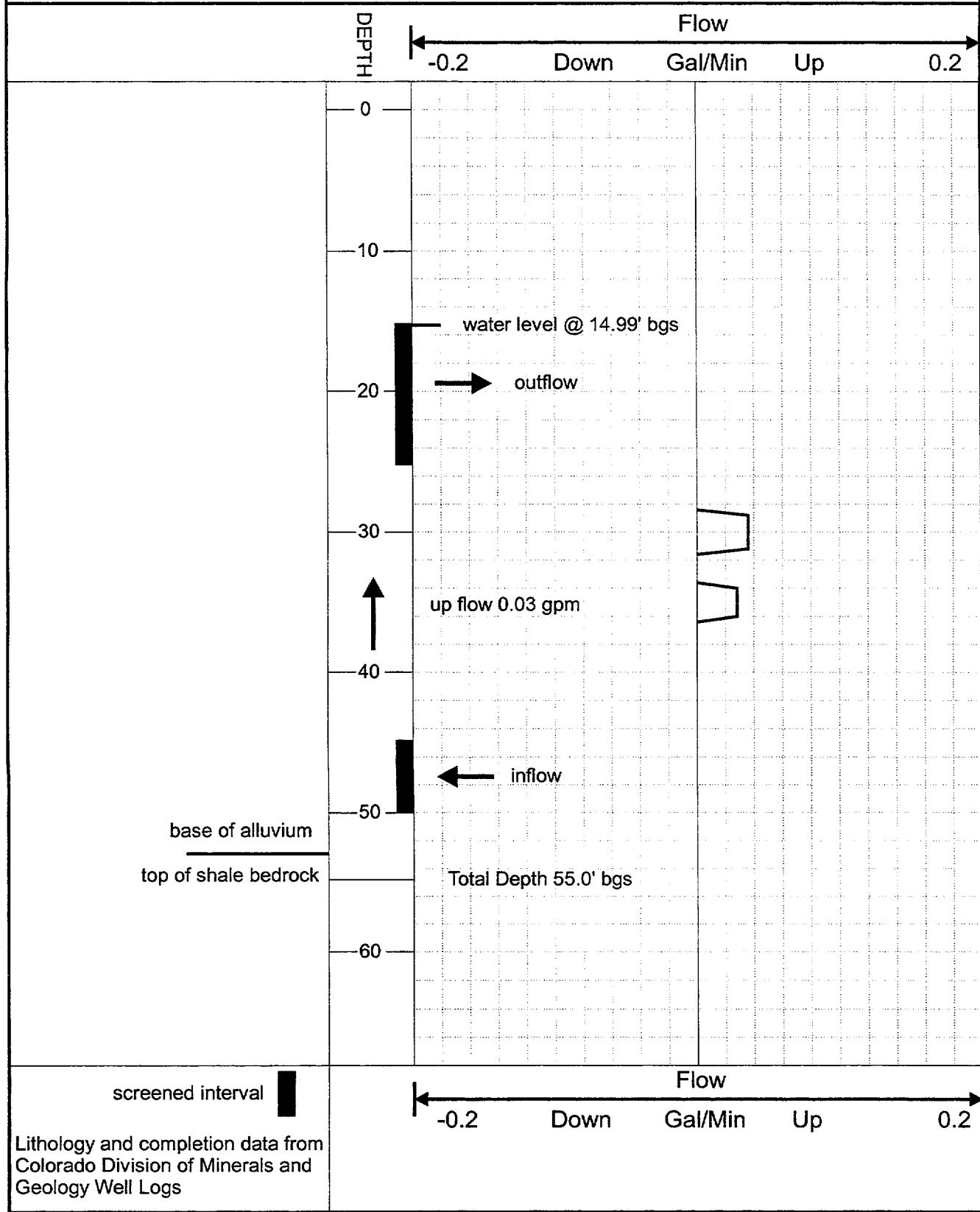


Figure 7-8

Flow Histogram January 1997: MW-8

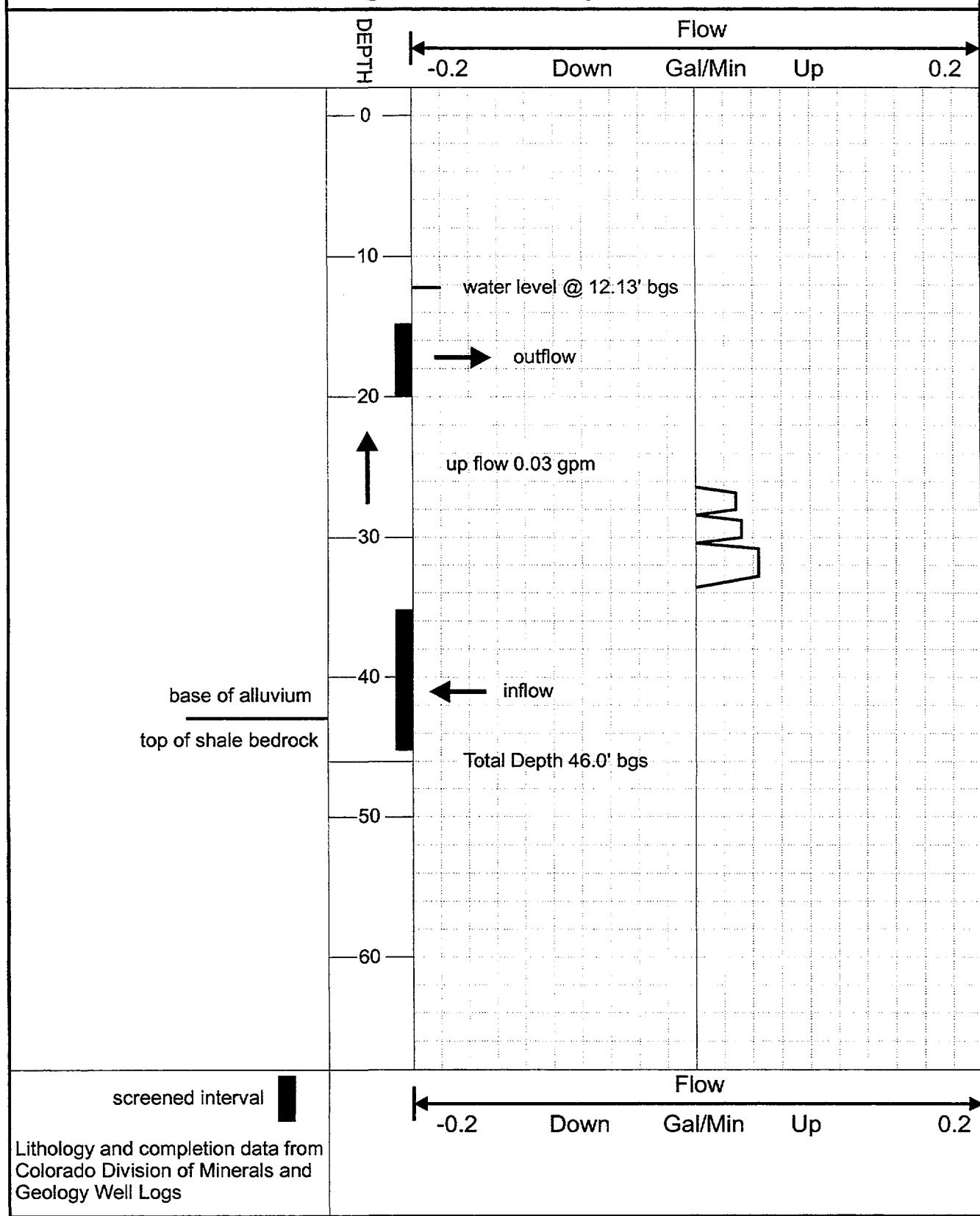


Figure 7-9

January 1997 Oro Shaft Stable Isotope Data

March 1996 Mine, Ground and French Creek Water Stable Isotope Data

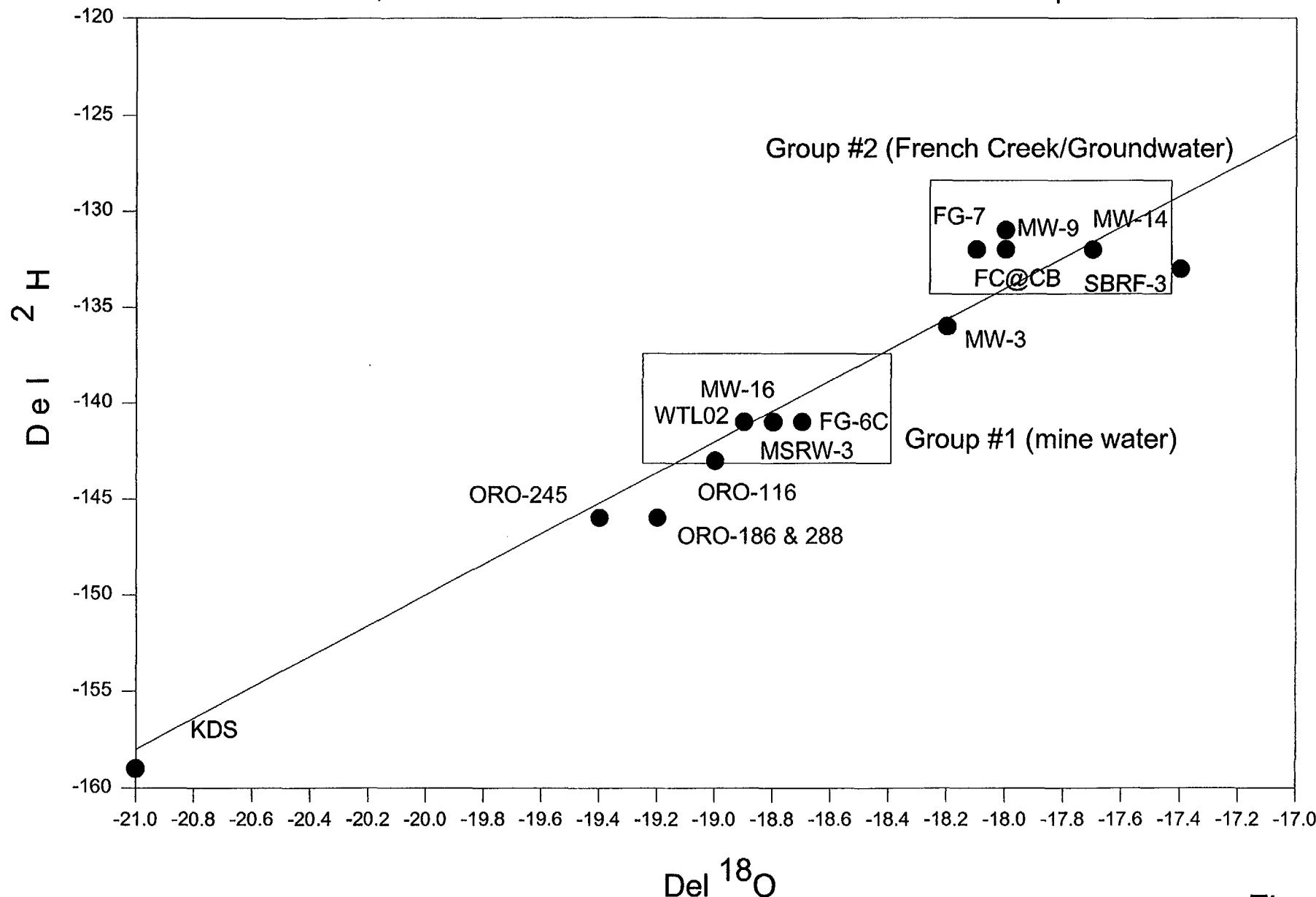


Figure 7-10

January 1997 Oro Shaft Stabe Isotope Data

March 1997 Snow, Mine, Ground and French Creek Water Isotope Data

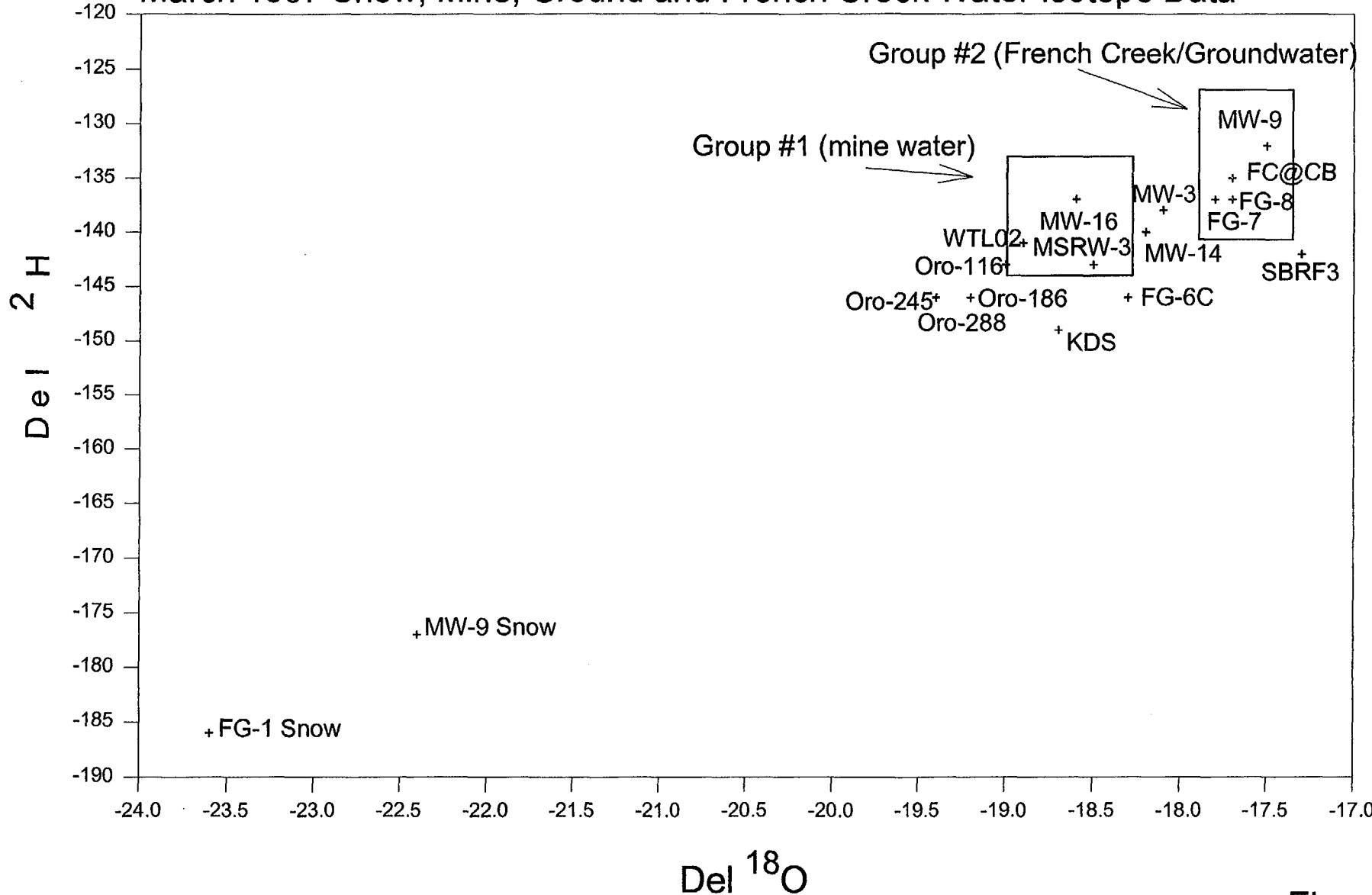
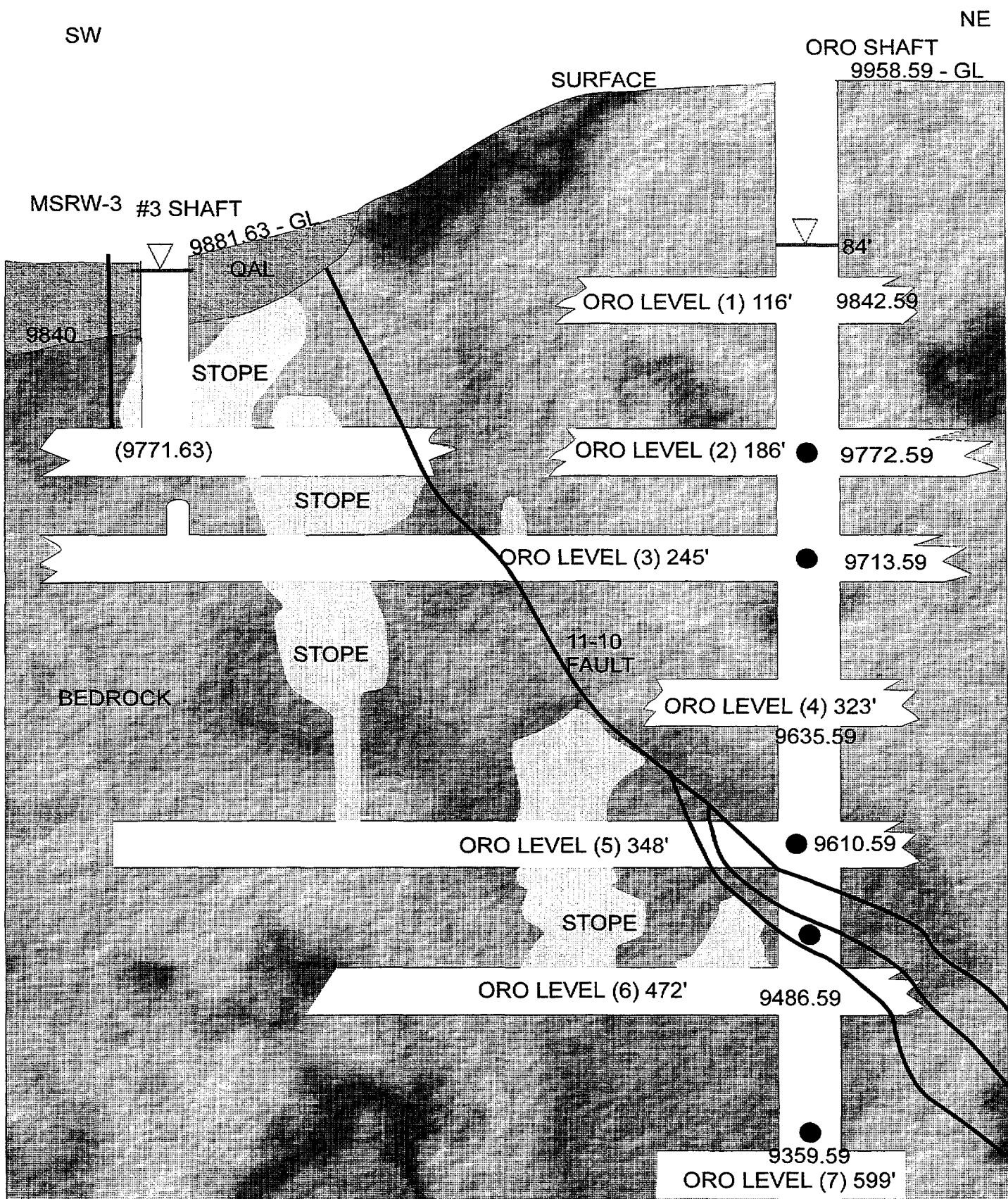


Figure 7-11



High Flow June 1998

SCHEMATIC DIAGRAM OF THE ORO SHAFT

● Sample Locations
NOT TO SCALE

DEPTH MEASURED FROM ORO SURFACE
DRAFTED BY AMERICAN GEOLOGICAL SERVICES, INC
AFTER LOVERING (1934)

Figure 7-12

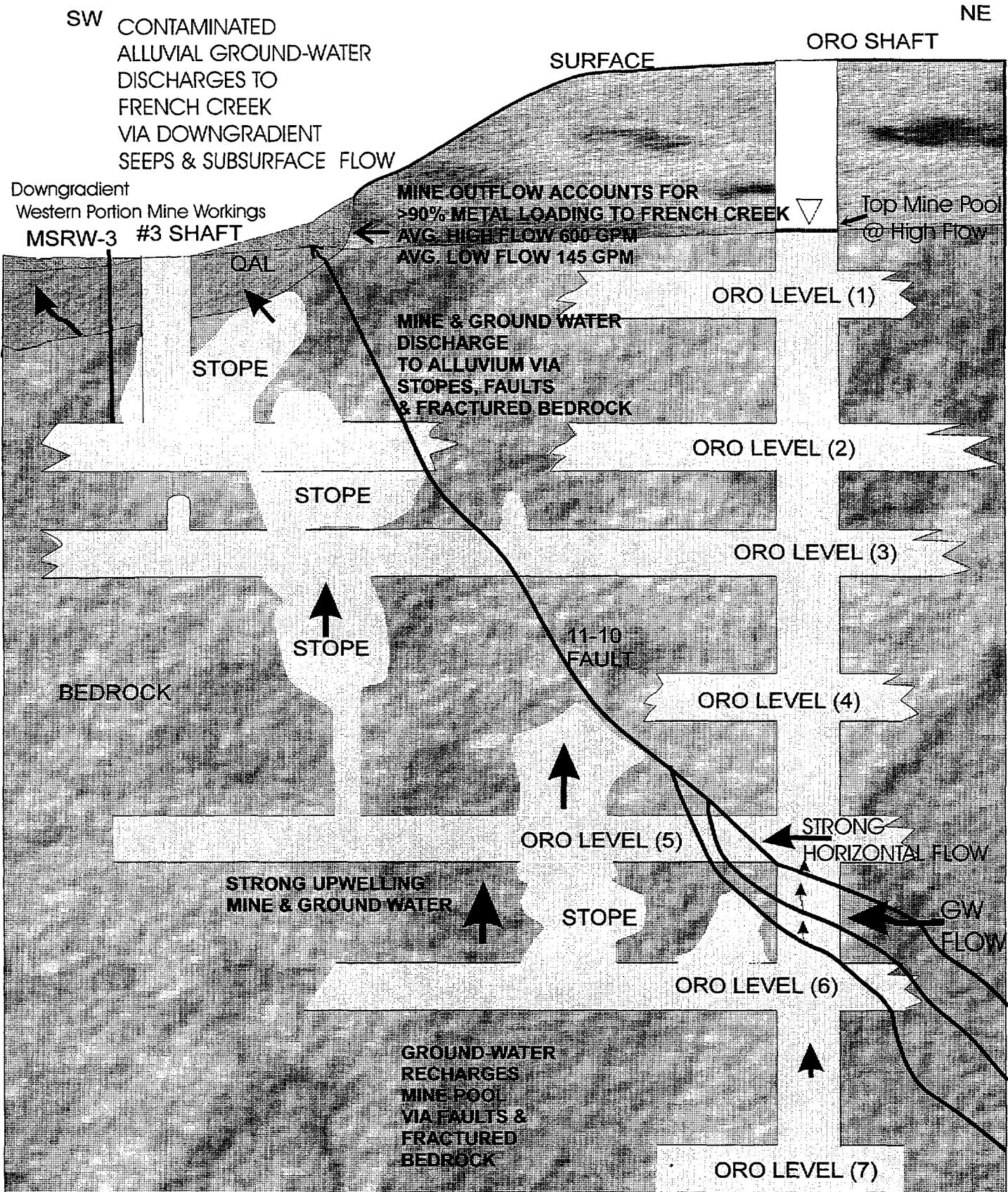


FIGURE 7-12a

Summary of Hydrophysical Logs For Ambient Flow
Characterization,
Injection at 523 Feet bgs, Oro Mine Shaft

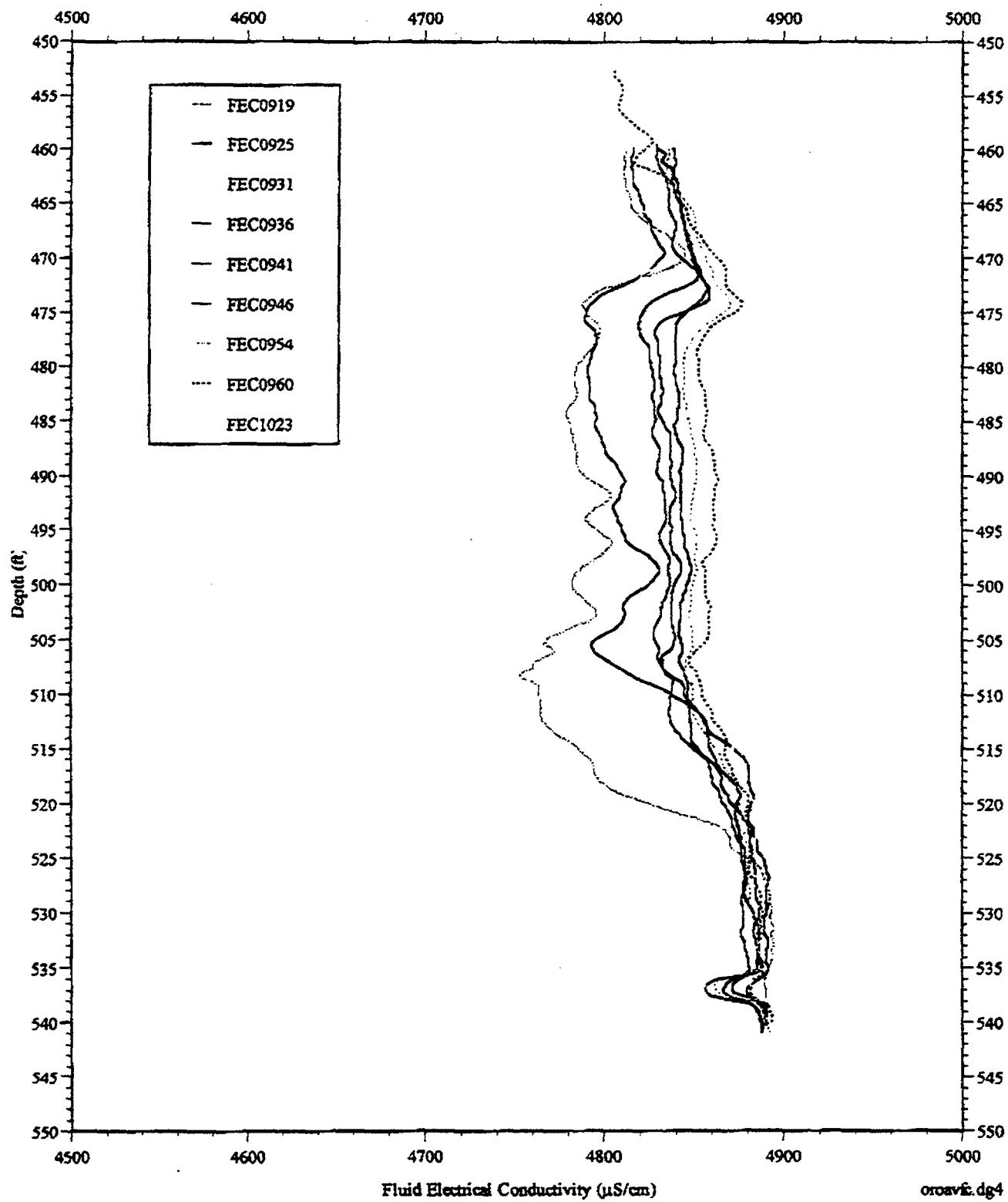


Figure 7-13

Oro Mine Shaft
Pre-Injection Fluid Electrical Conductivity (FEC) and Temperature Survey

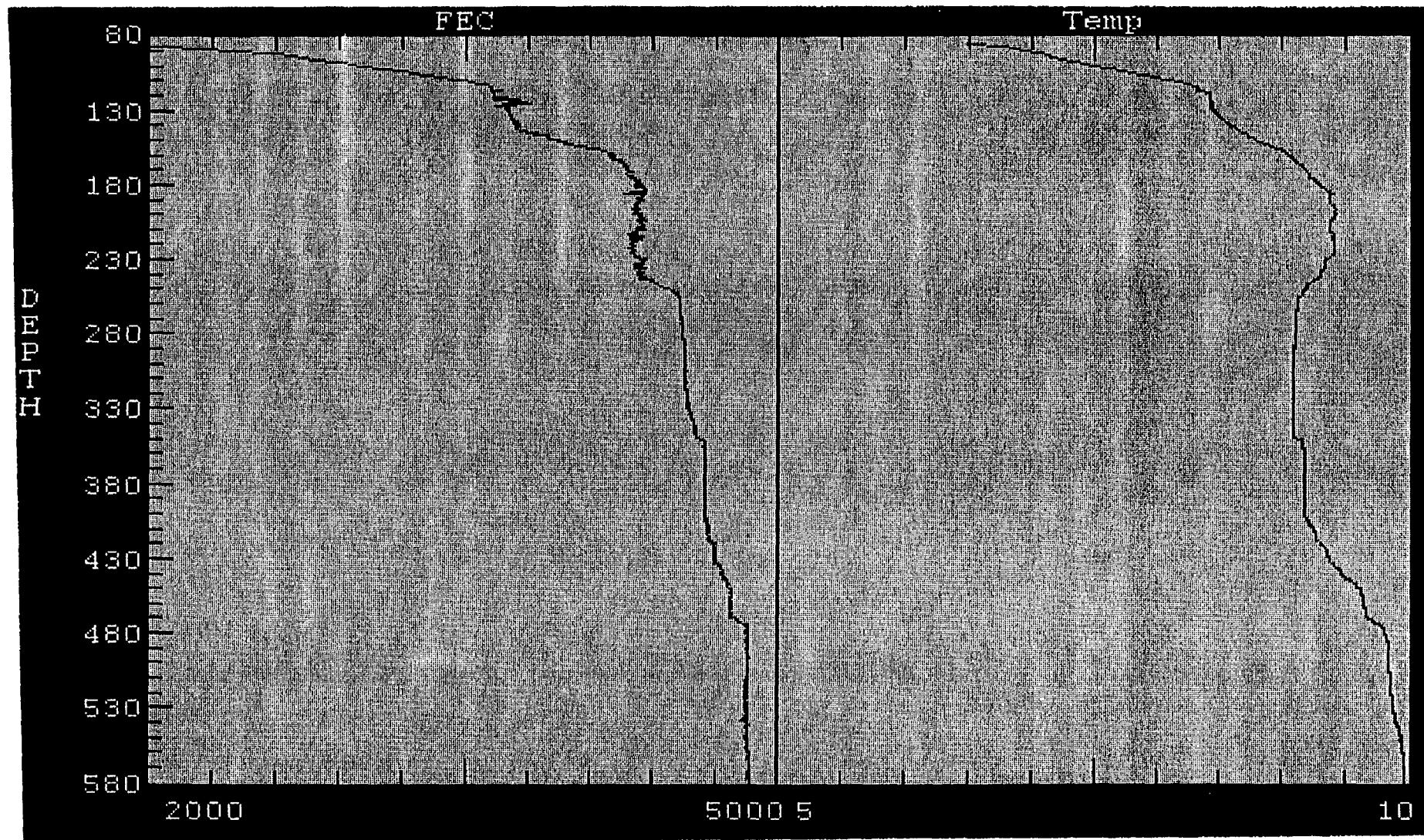


Figure 7-14

**French Gulch Stable Isotope Data:
1996, 1997, and 1998**

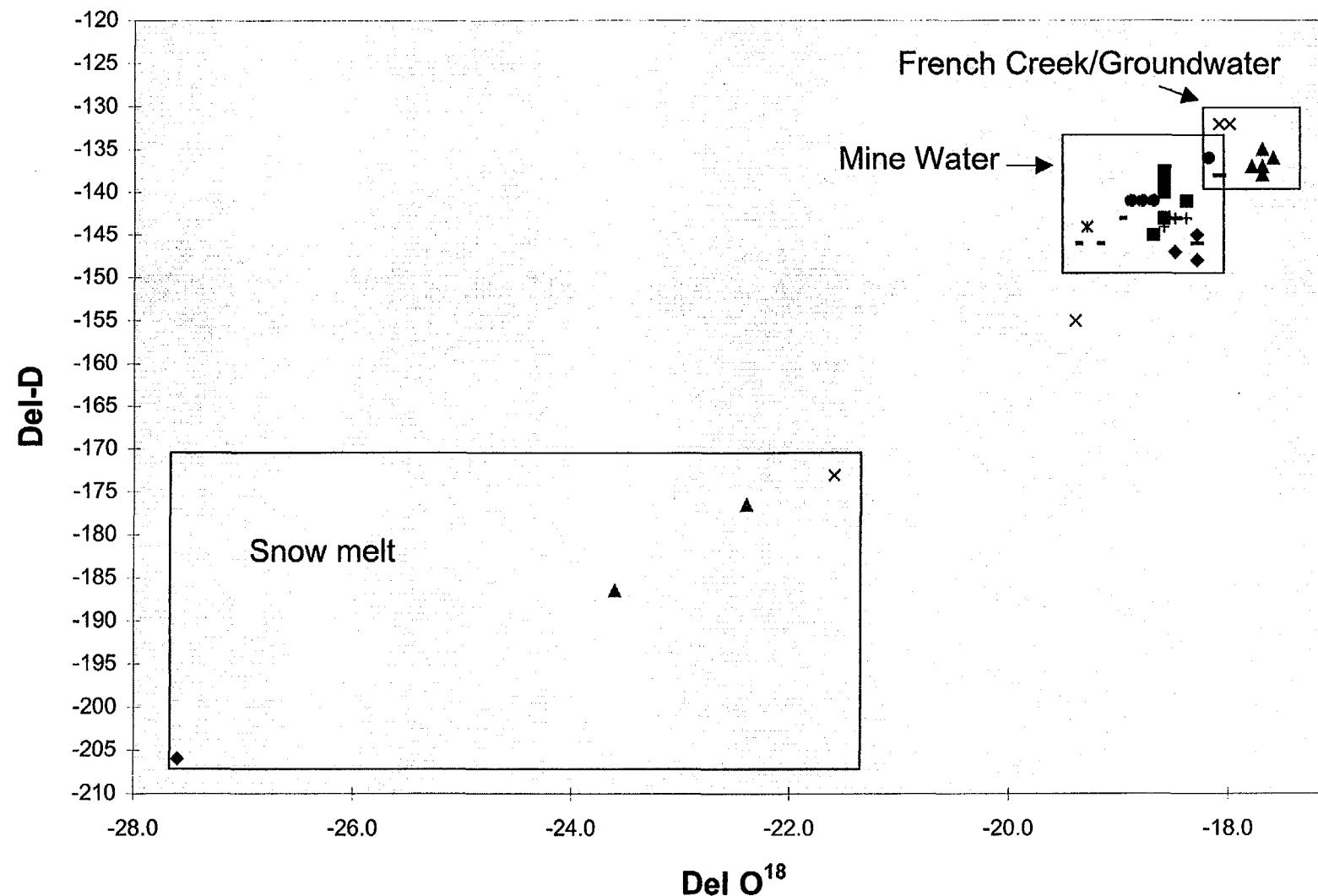


Figure 7-15

June 1998
Stable Isotope Data

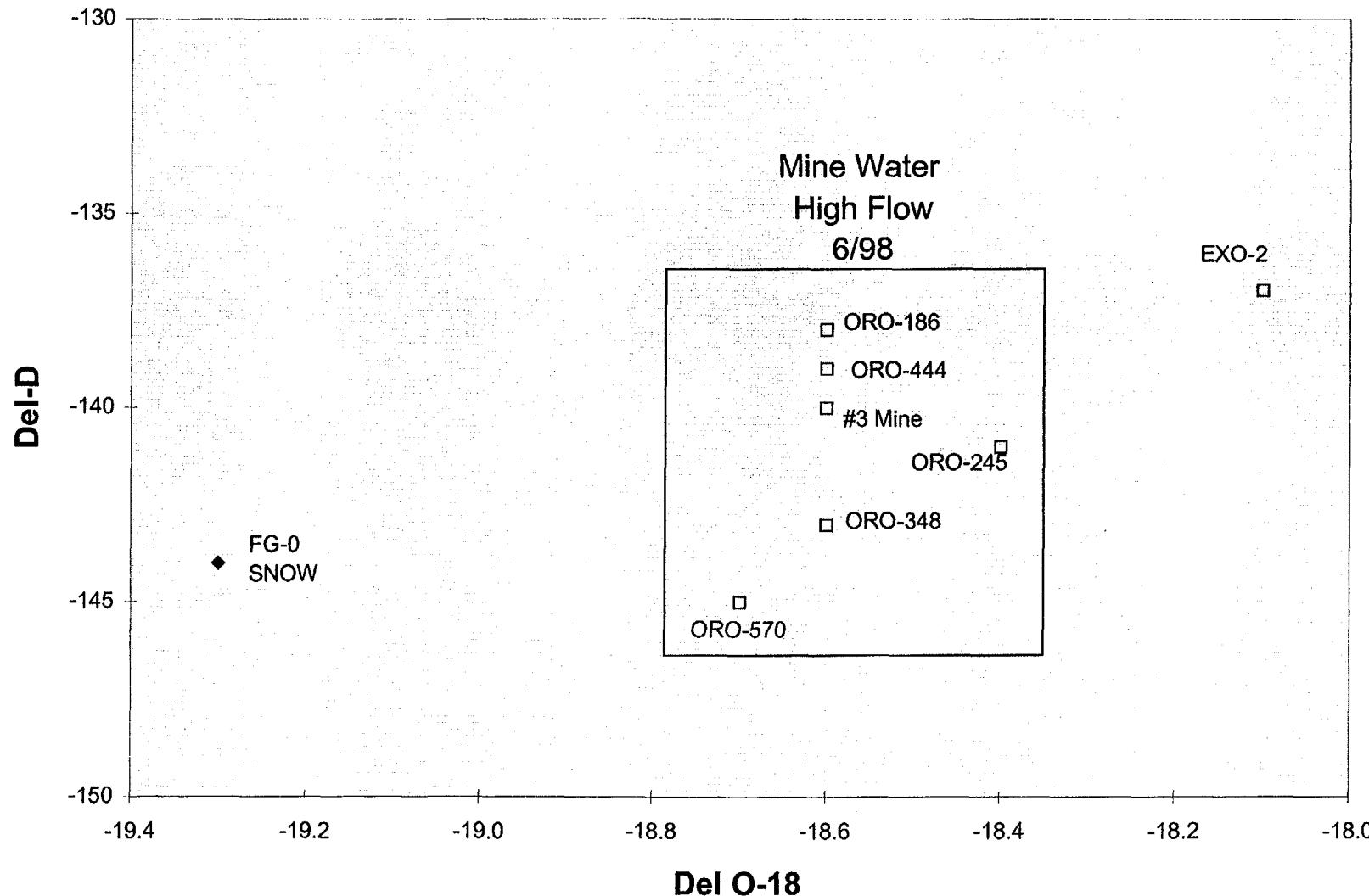


Figure 7-16

**January 1997 and June 1998
Oro Shaft Stable Isotope Data**

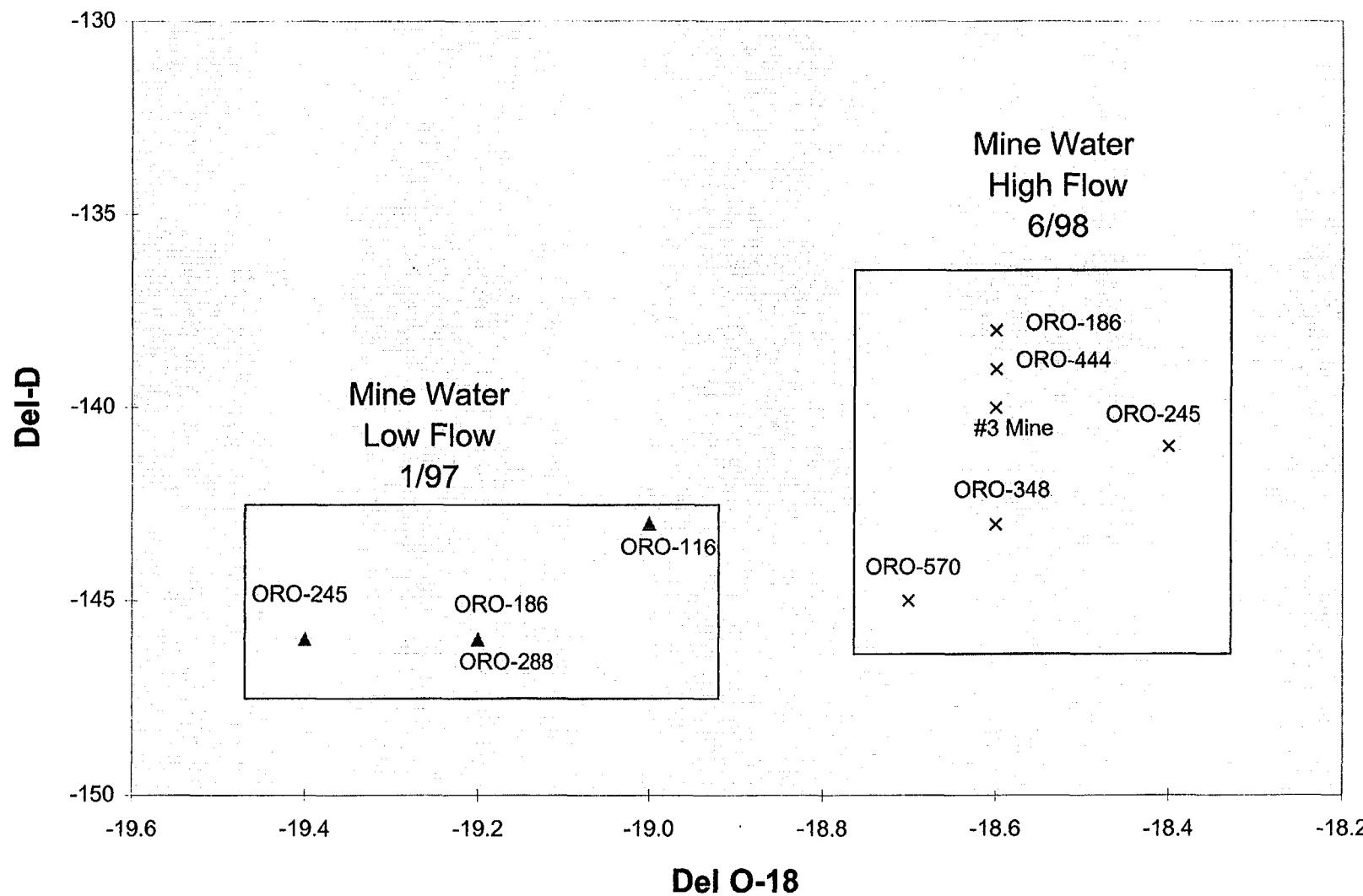


Figure 7-17

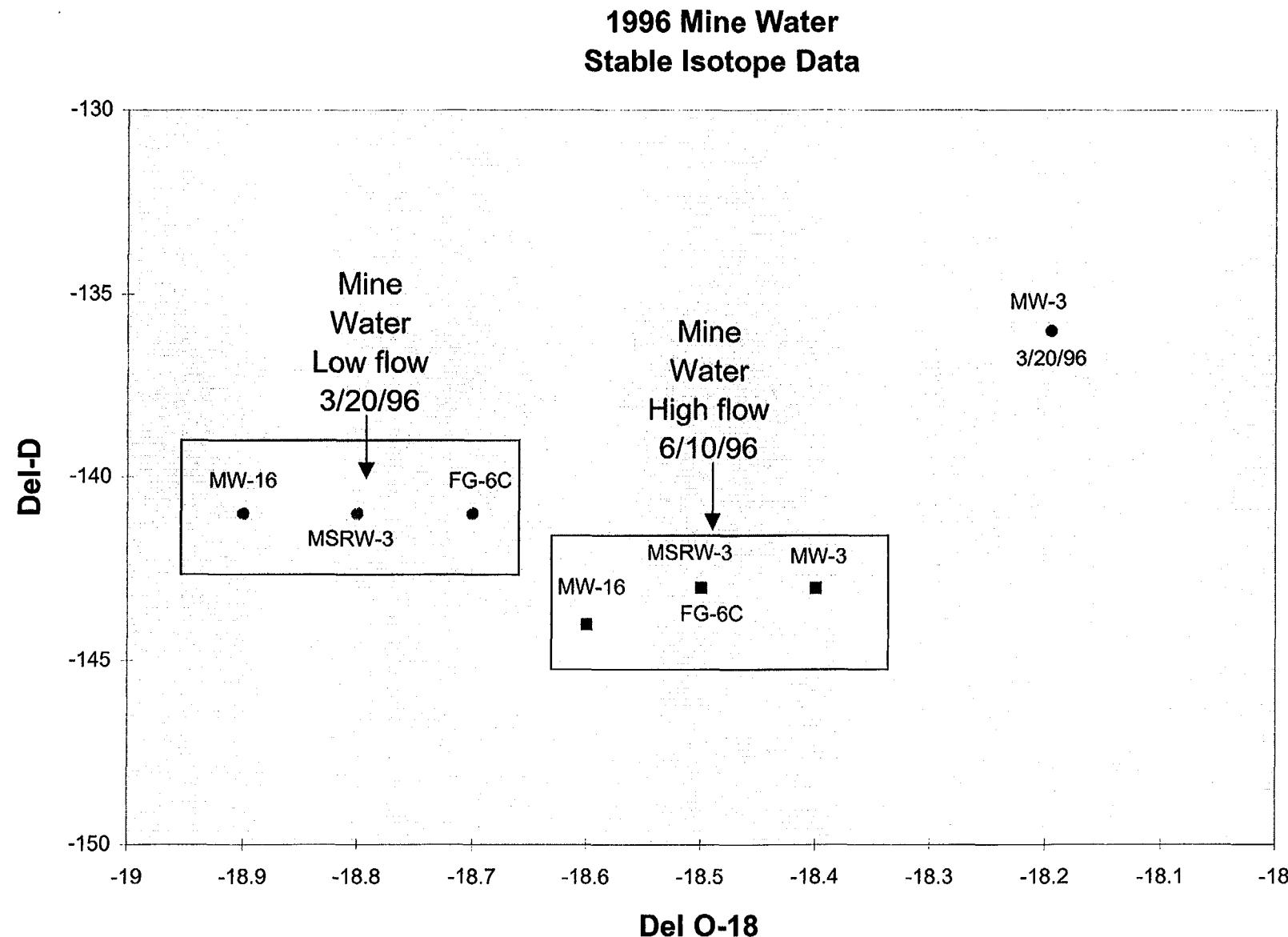


Figure 7-18

1997 Mine Water Stable Isotope Data

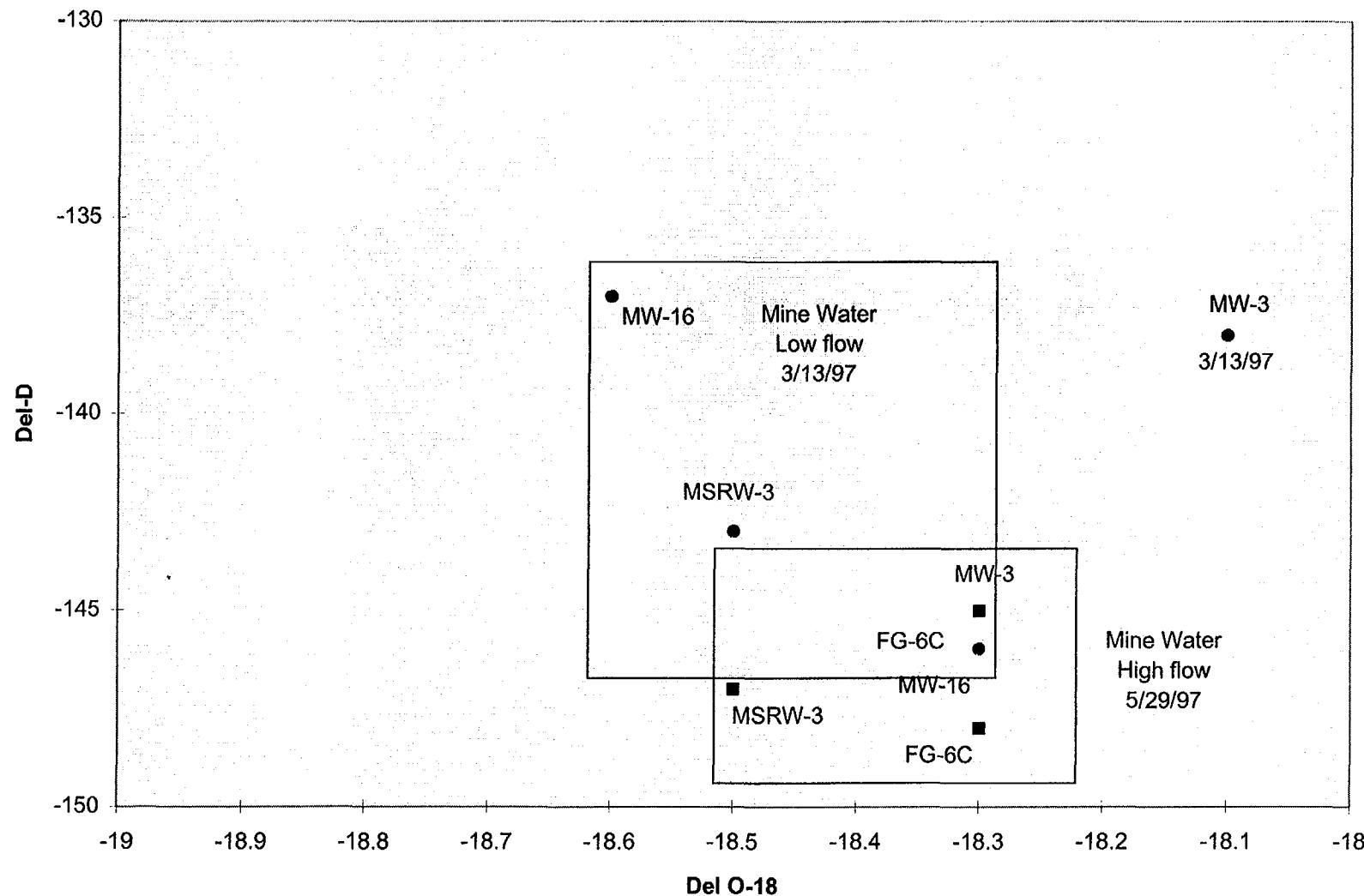


Figure 7-19

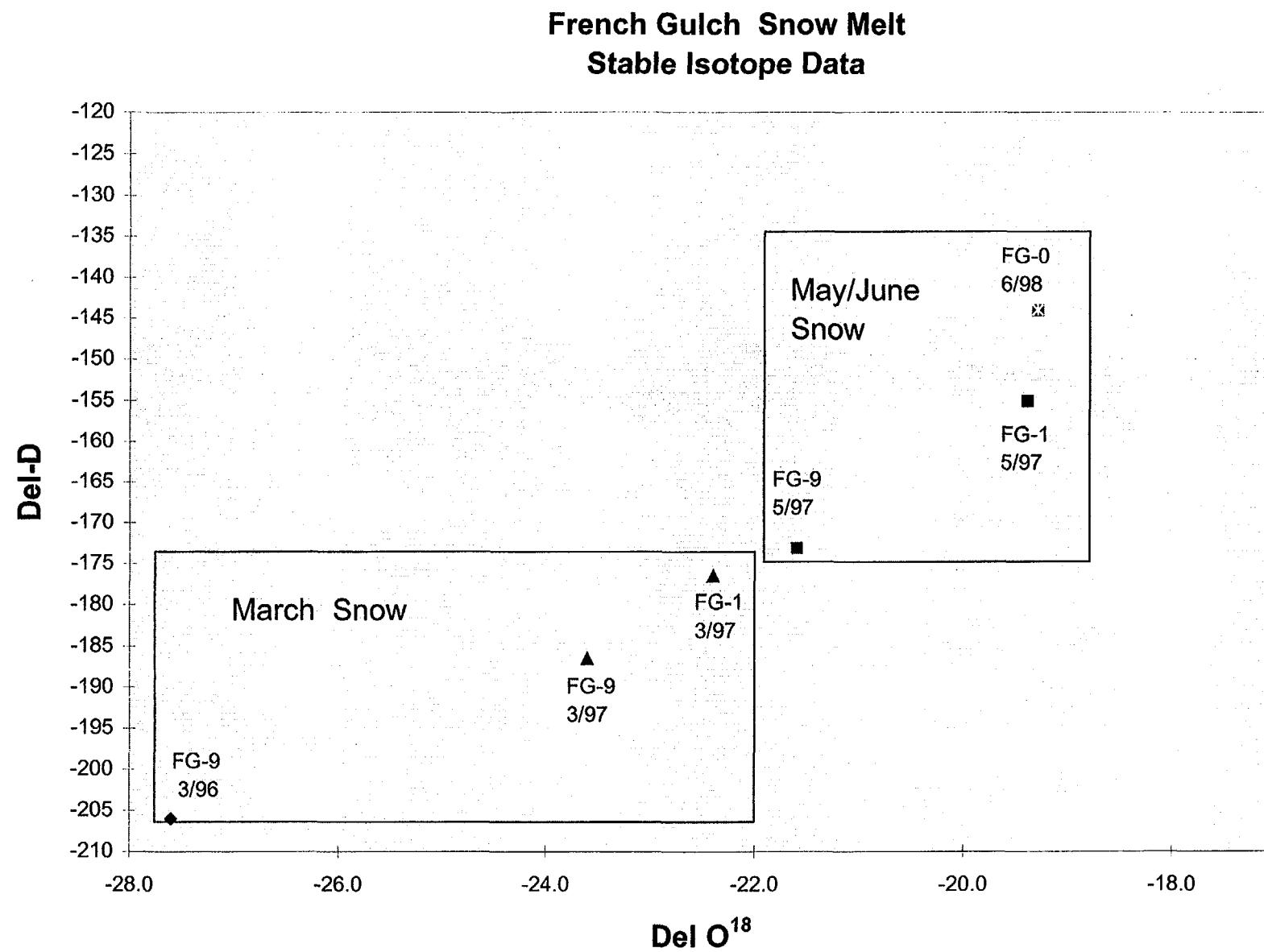


Figure 7-20

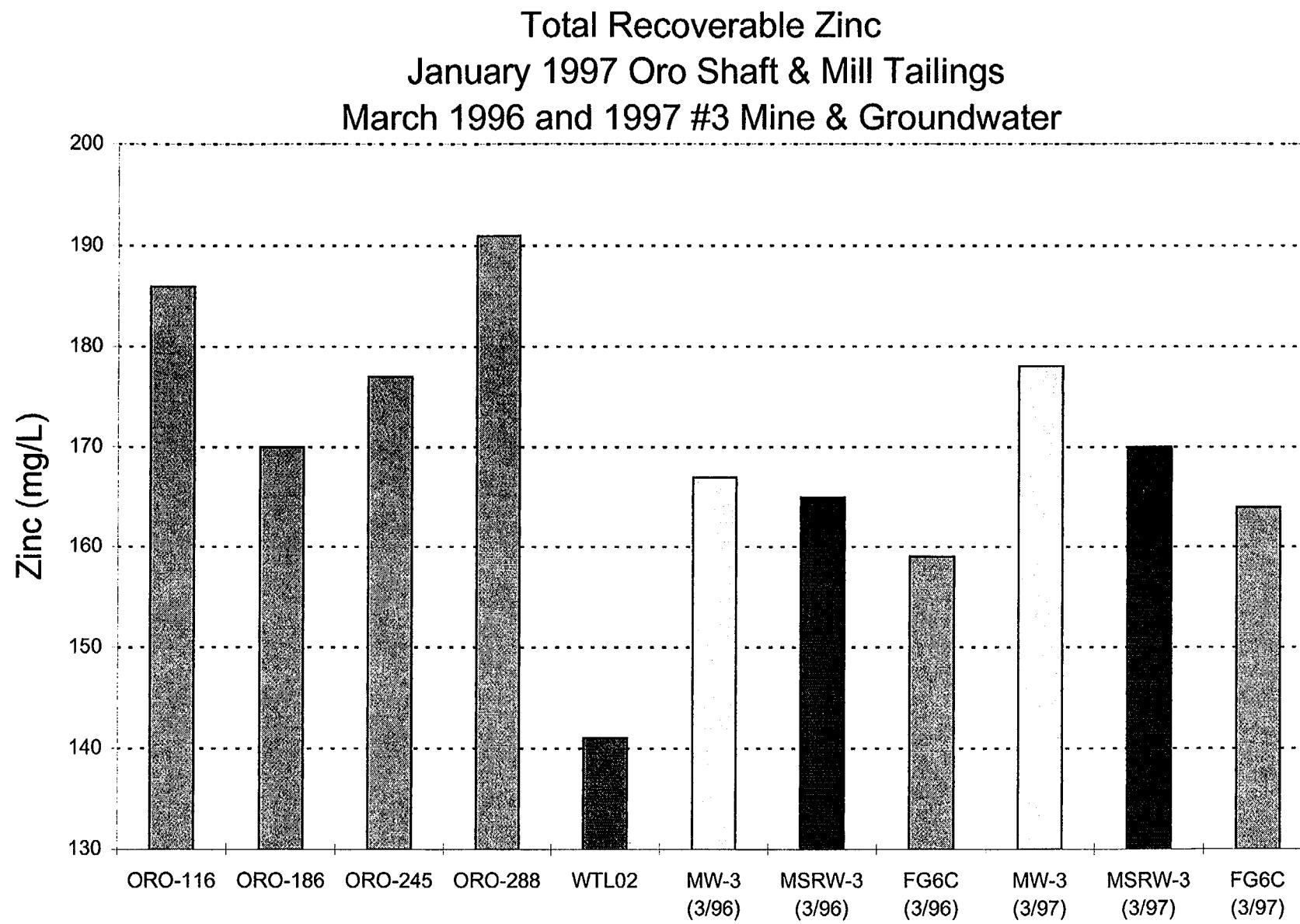


Figure 7-21

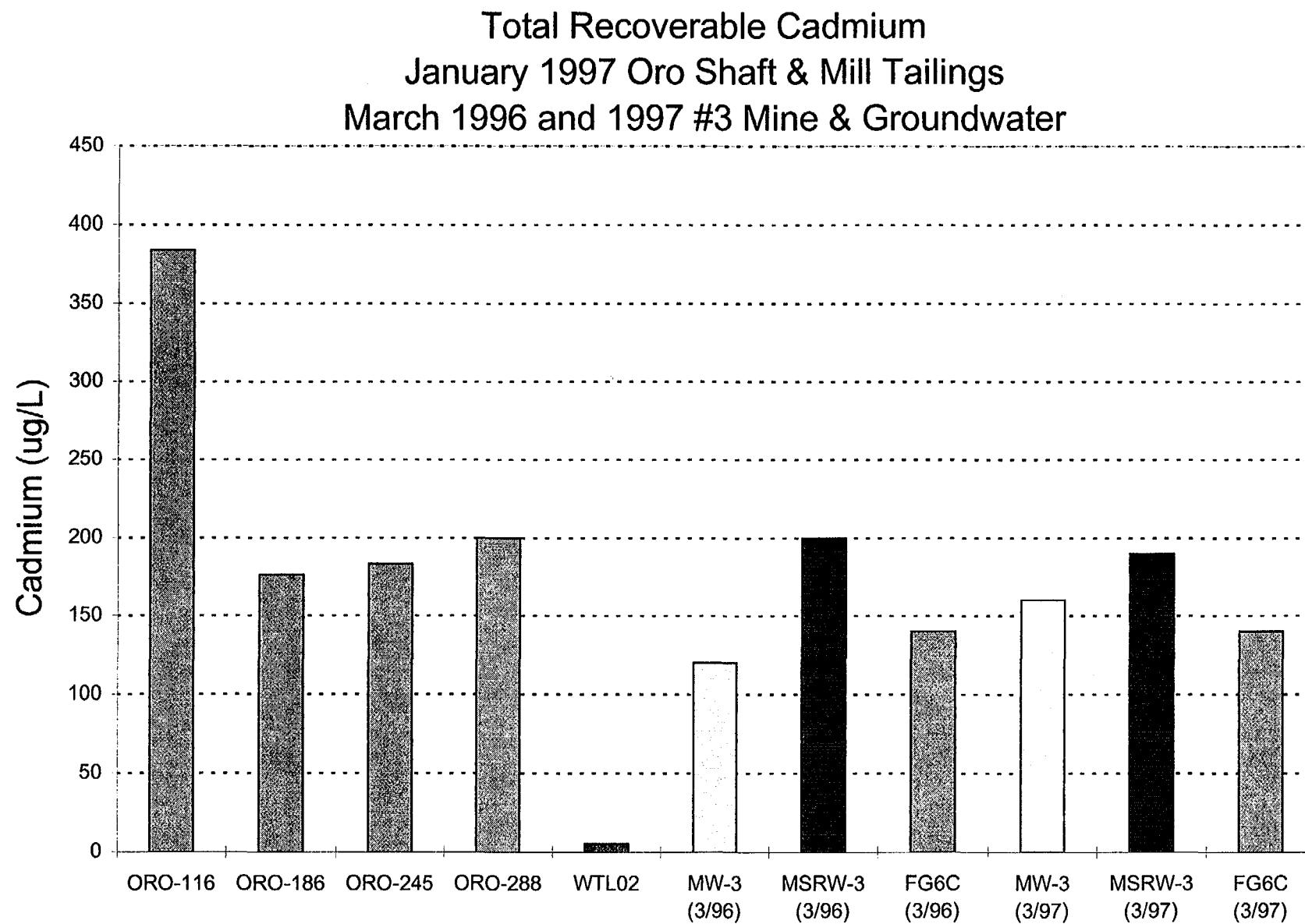


Figure 7-22

Total Recoverable Iron
January 1997 Oro Shaft & Mill Tailings
March 1996 and 1997 #3 Mine & Groundwater

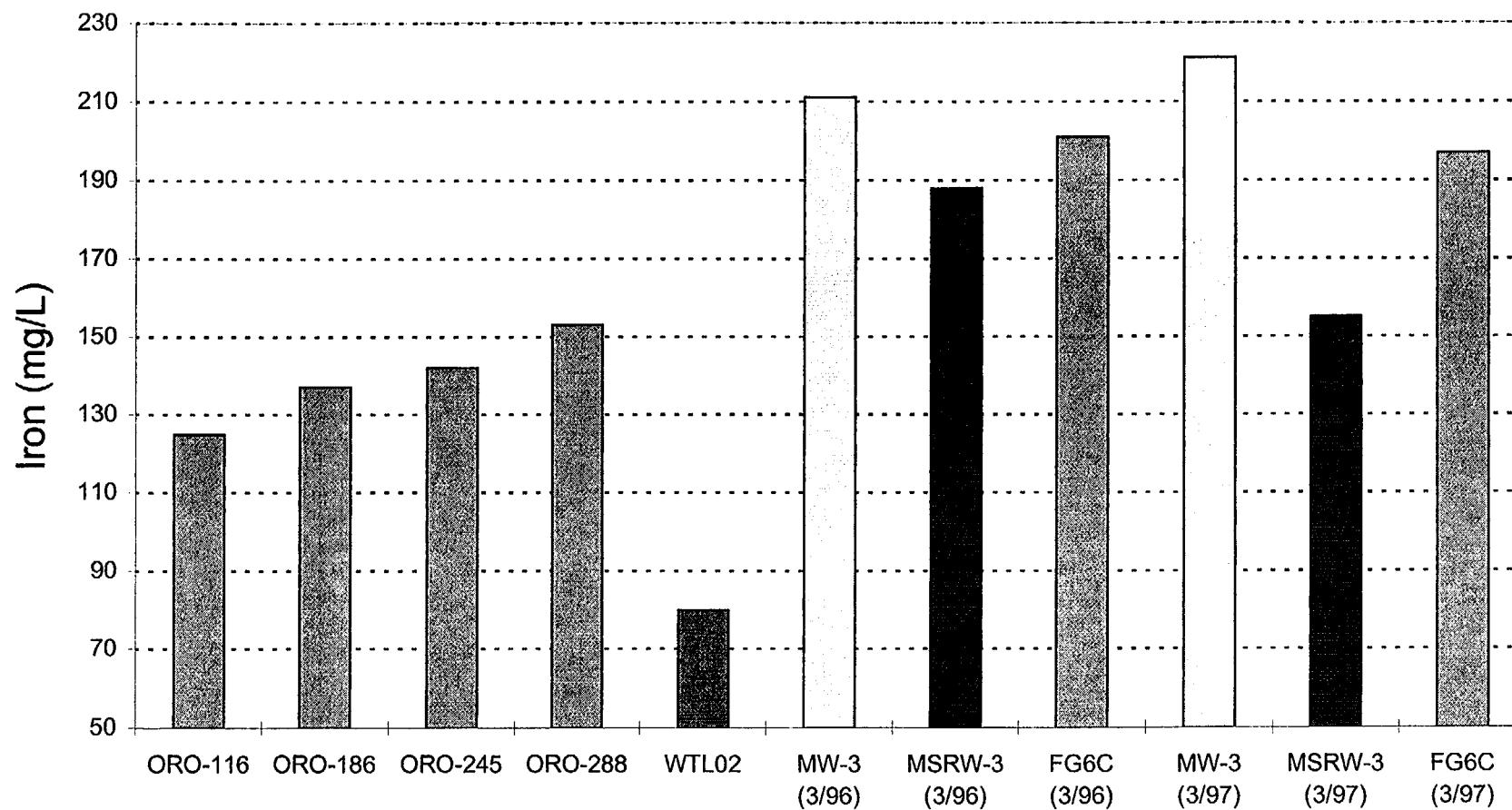


Figure 7-23

Total Recoverable Zinc
June 1998 Oro & #3 Mine Shafts

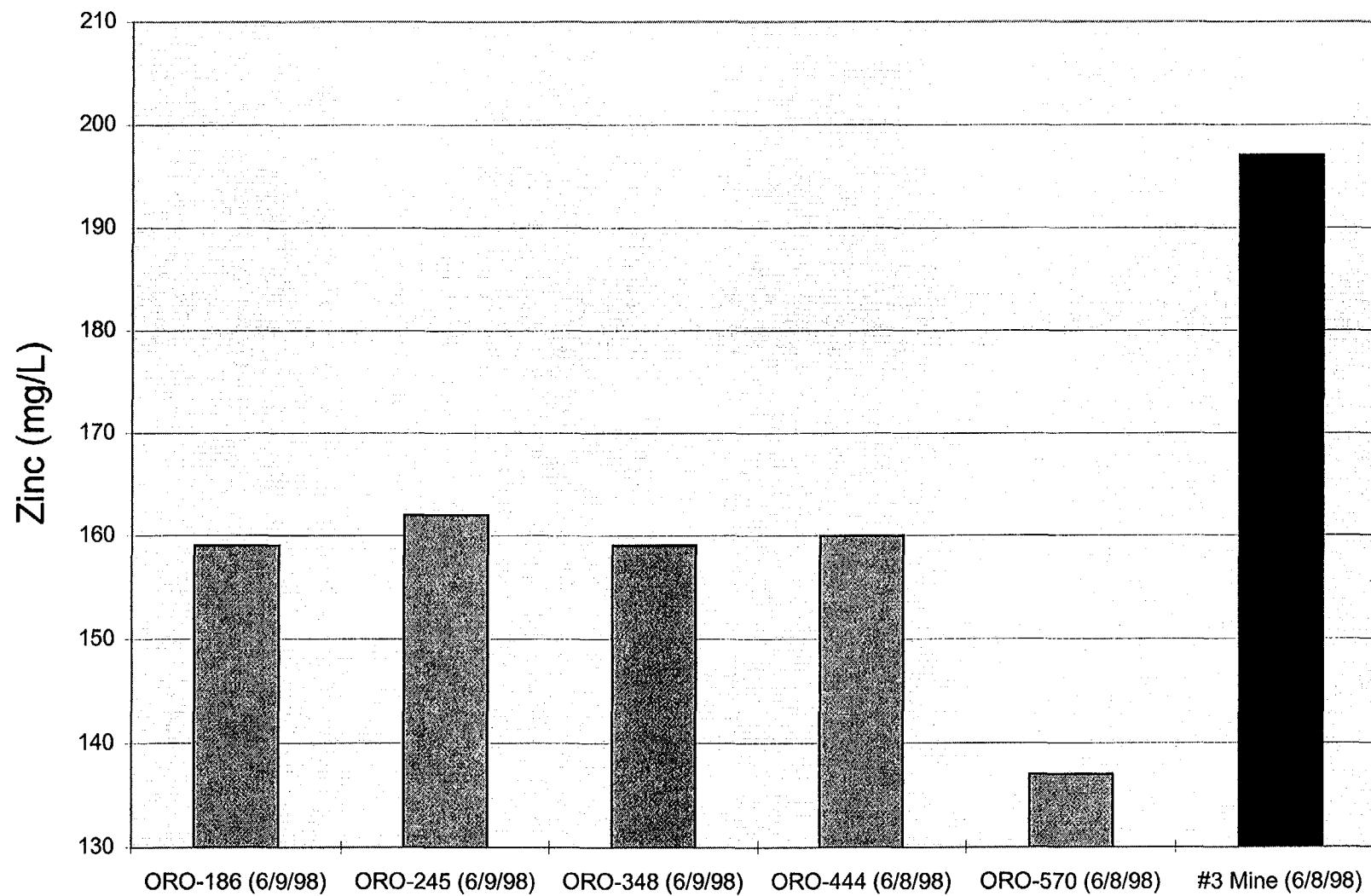


Figure 7-24

Total Recoverable Cadmium
June 1998 Oro & #3 Mine Shafts

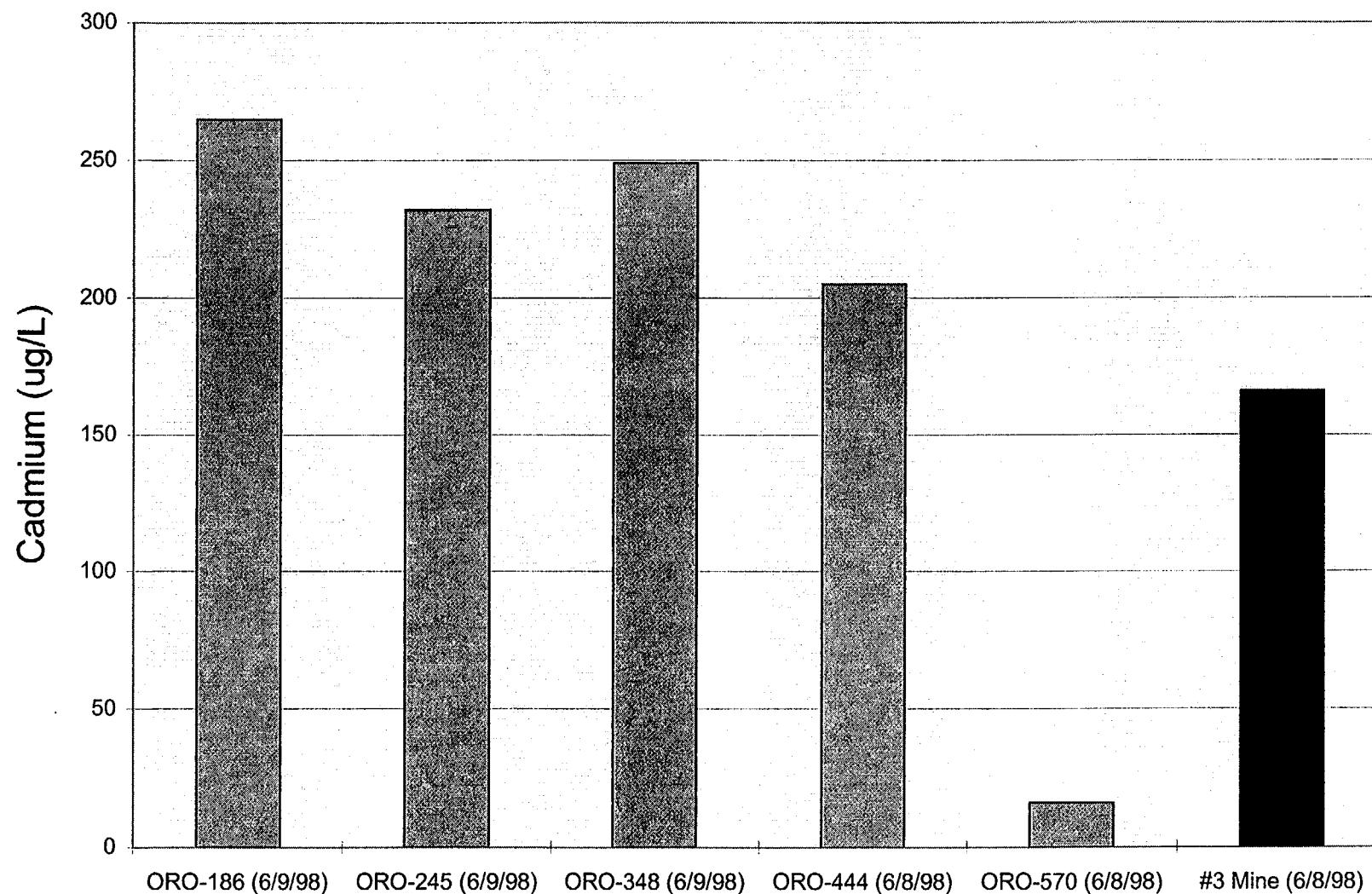


Figure 7-25

**Total Recoverable Iron
June 1998 Oro & #3 Mine Shafts**

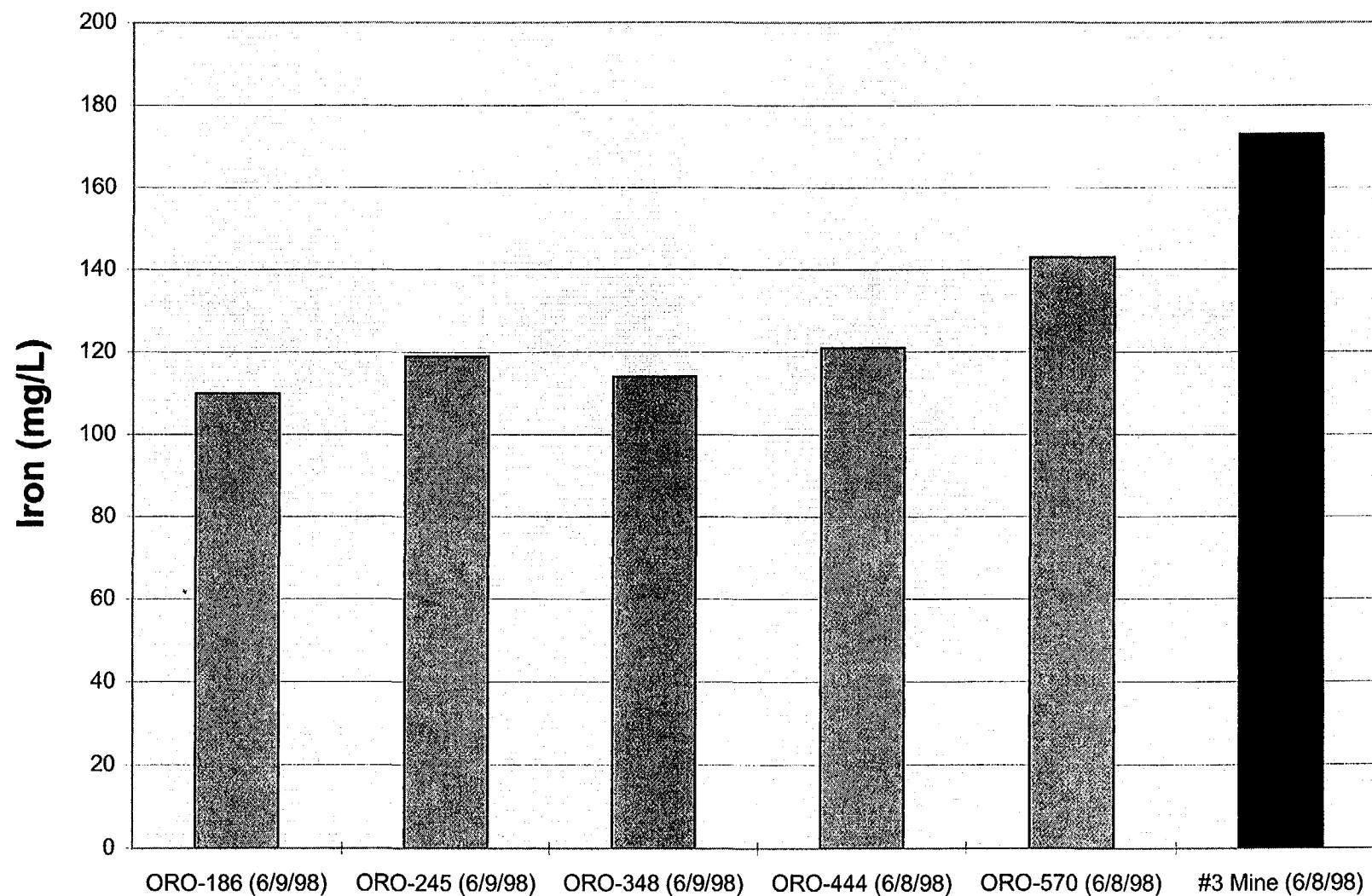


Figure 7-26

Eh - PH Diagram

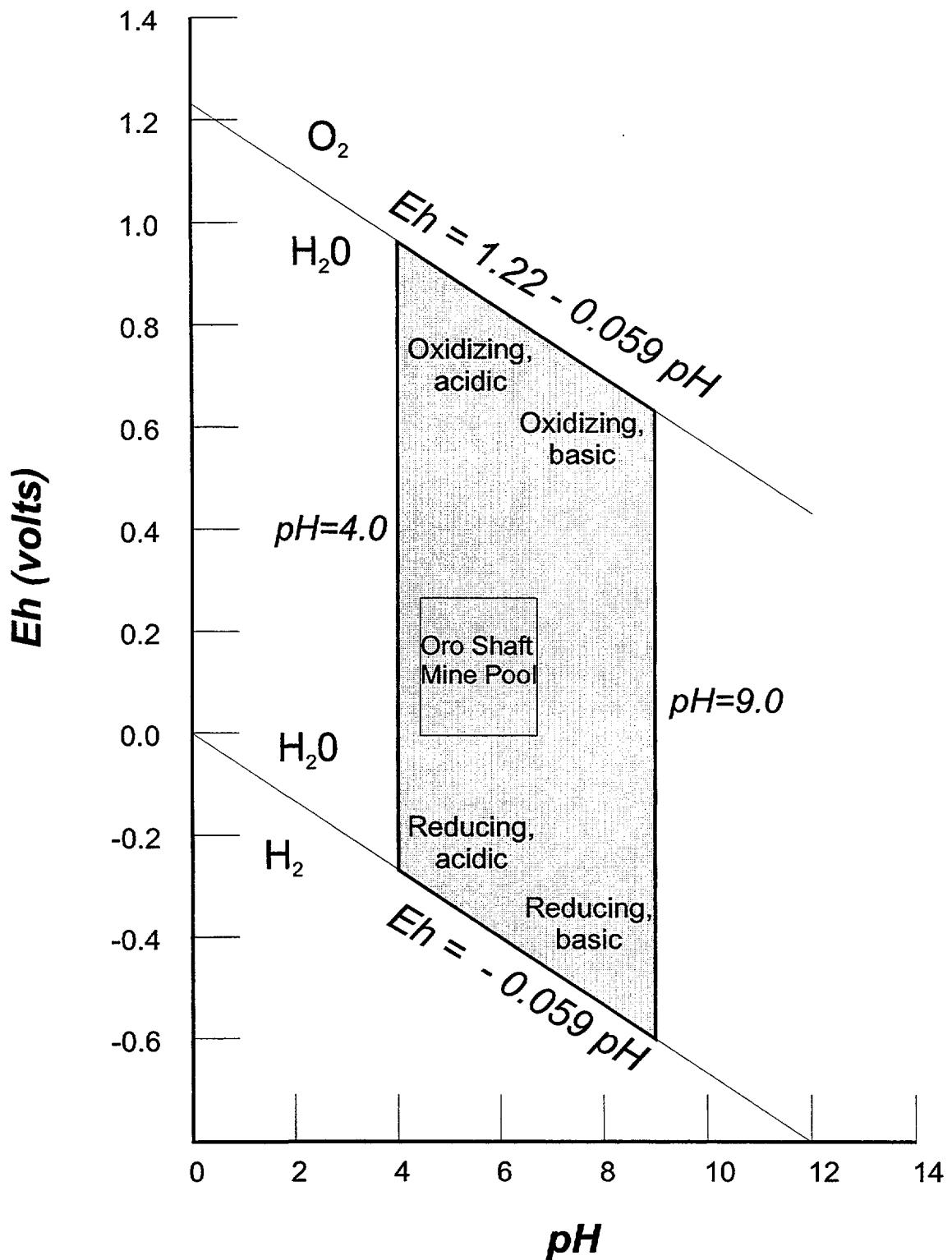


Figure 7-27

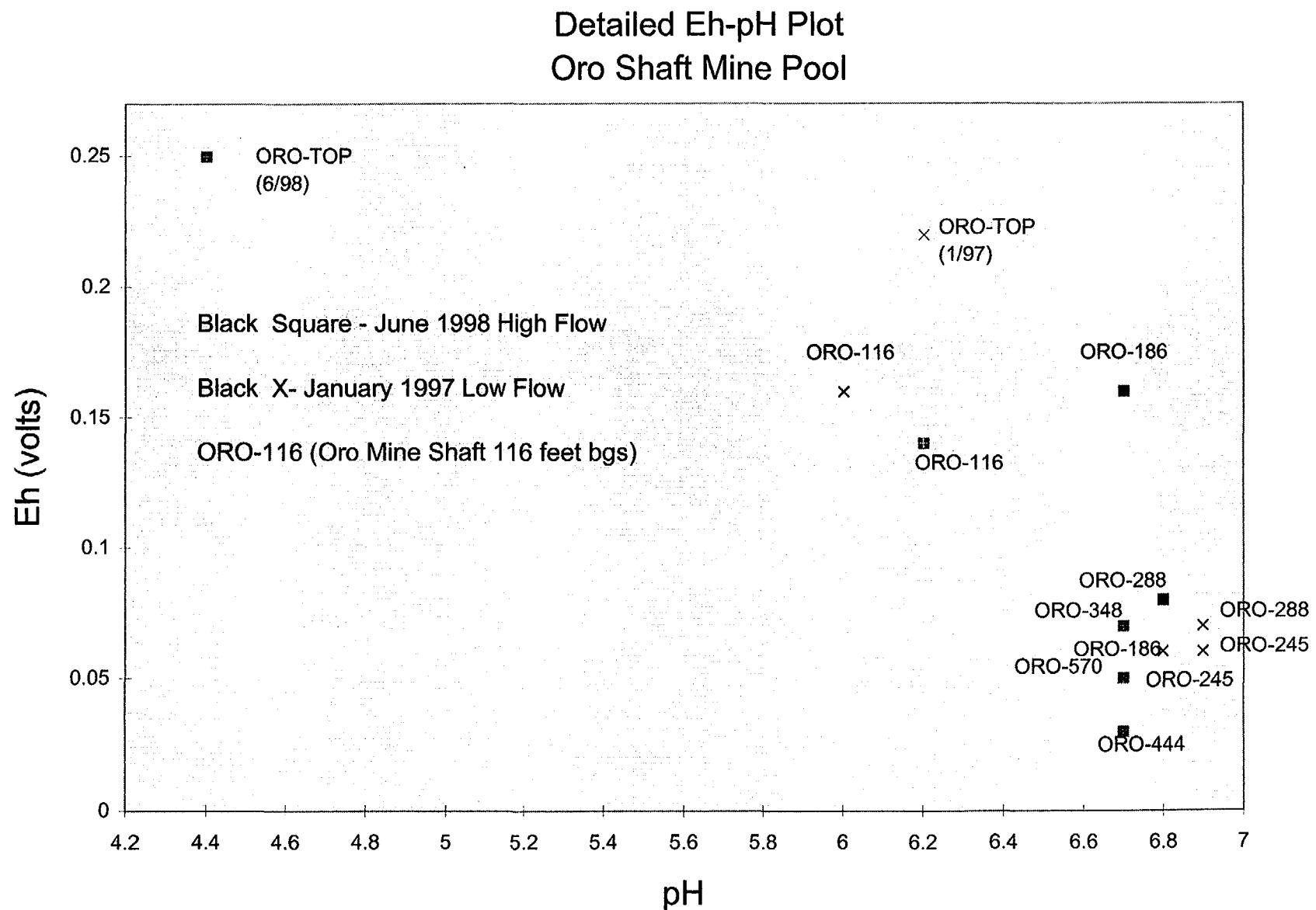


Figure 7-28

Dissolved Chloride
January 1997 Oro Shaft & Mill Tailings
March 1996 and 1997 #3 Mine & Groundwater

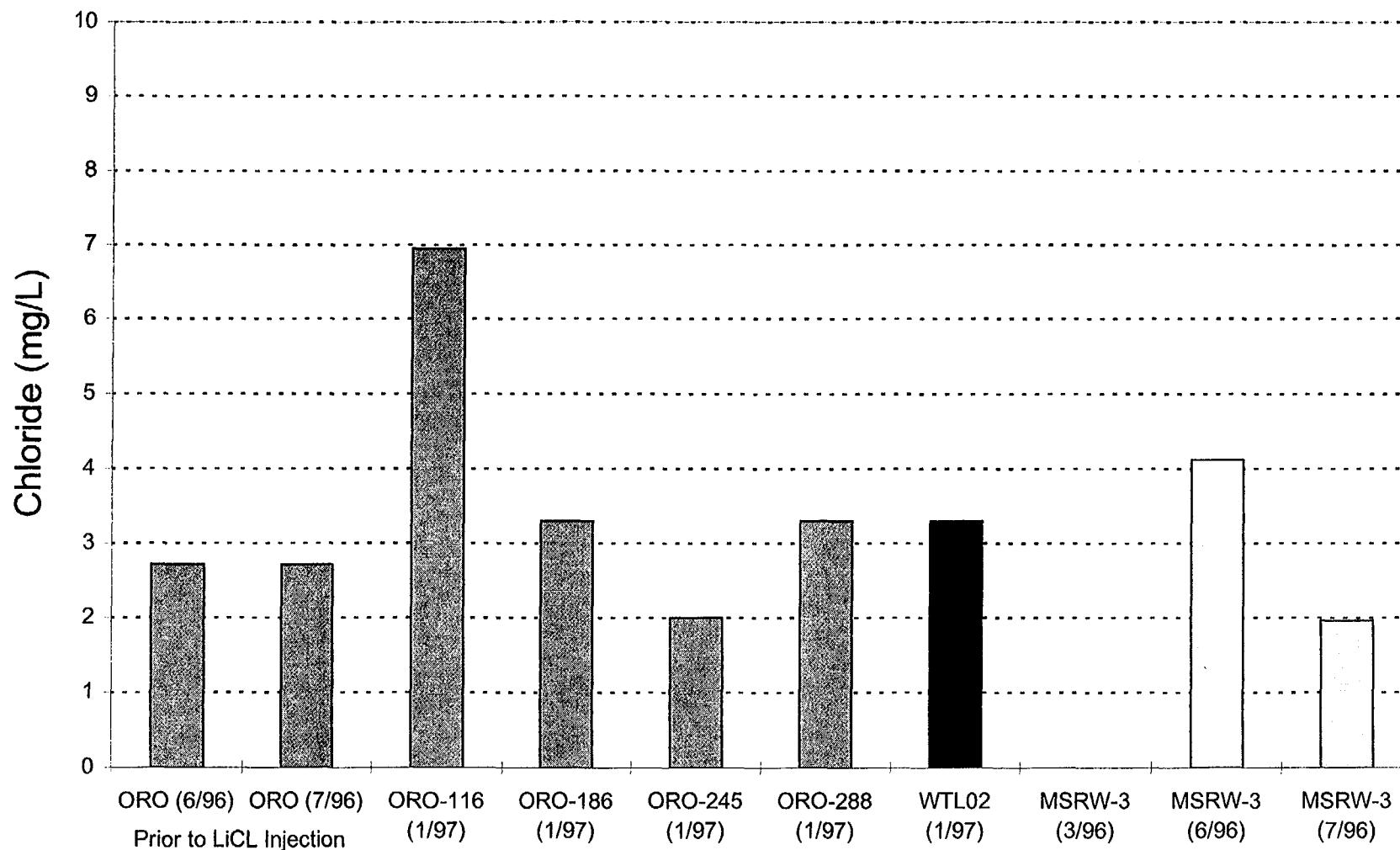


Figure 7-29

June 1998 Oro Mine Shaft
Ambient Temperature and Fluid Electrical Conductivity
(FEC)

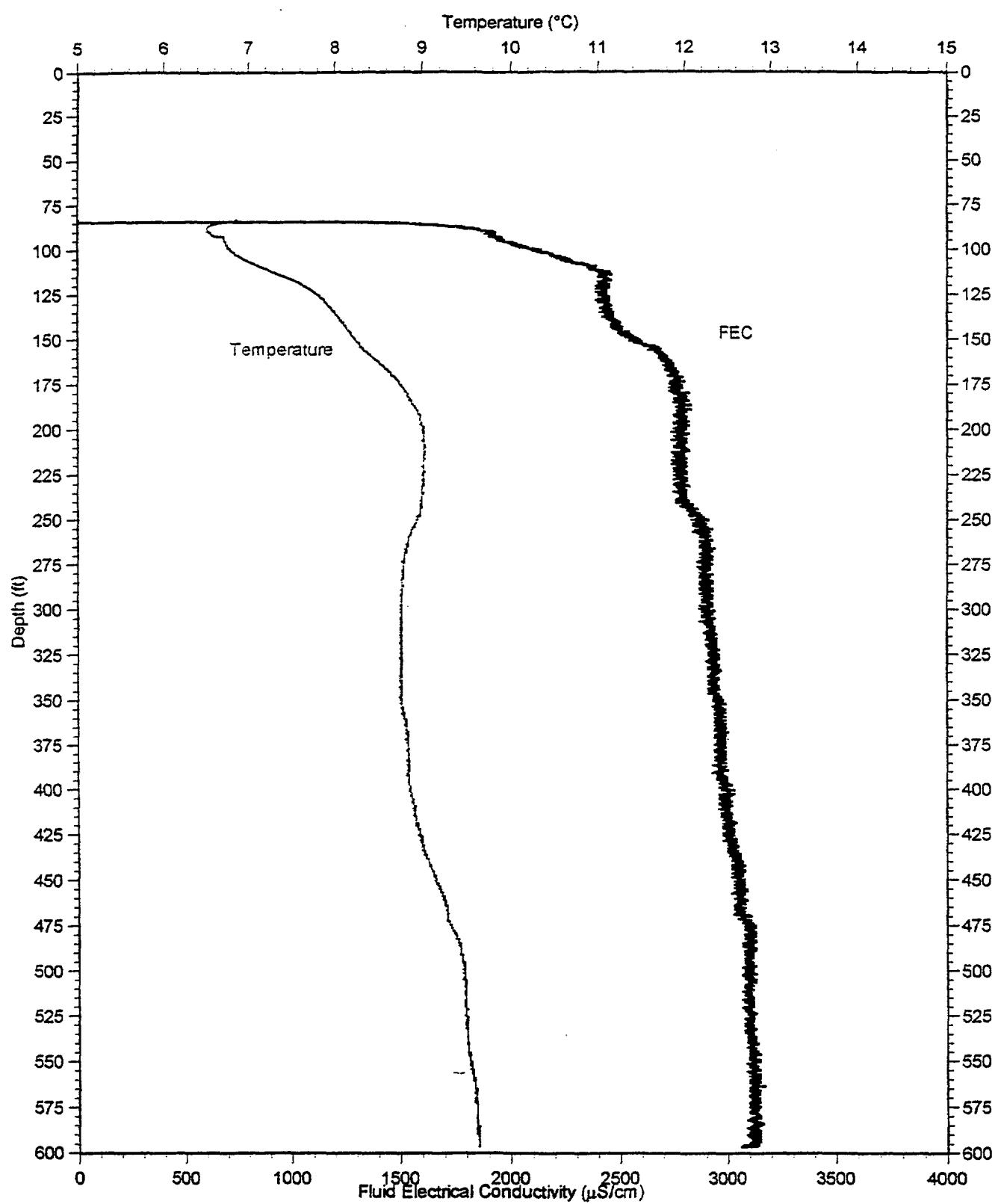
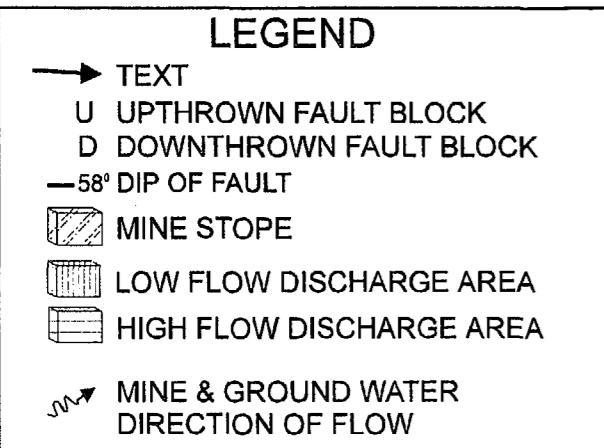


Figure 7-30

SCHEMATIC BLOCK DIAGRAM WELLINGTON-ORO (W-O) MINE WORKINGS



NOT TO SCALE
ELEVATION IN FEET ABOVE MEAN SEA LEVEL
MINE ELEVATIONS AFTER LOVERING (1934)

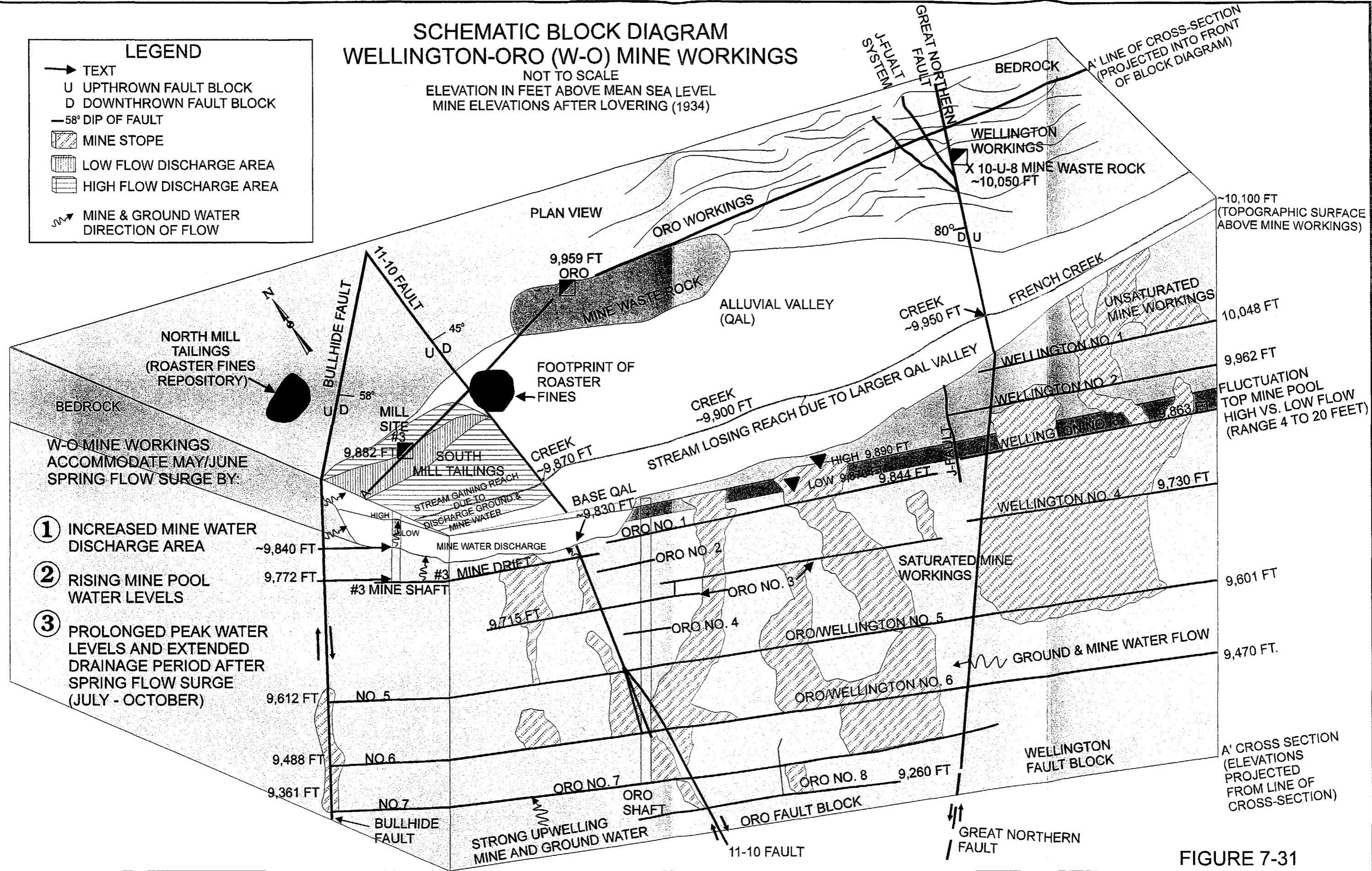


FIGURE 7-31

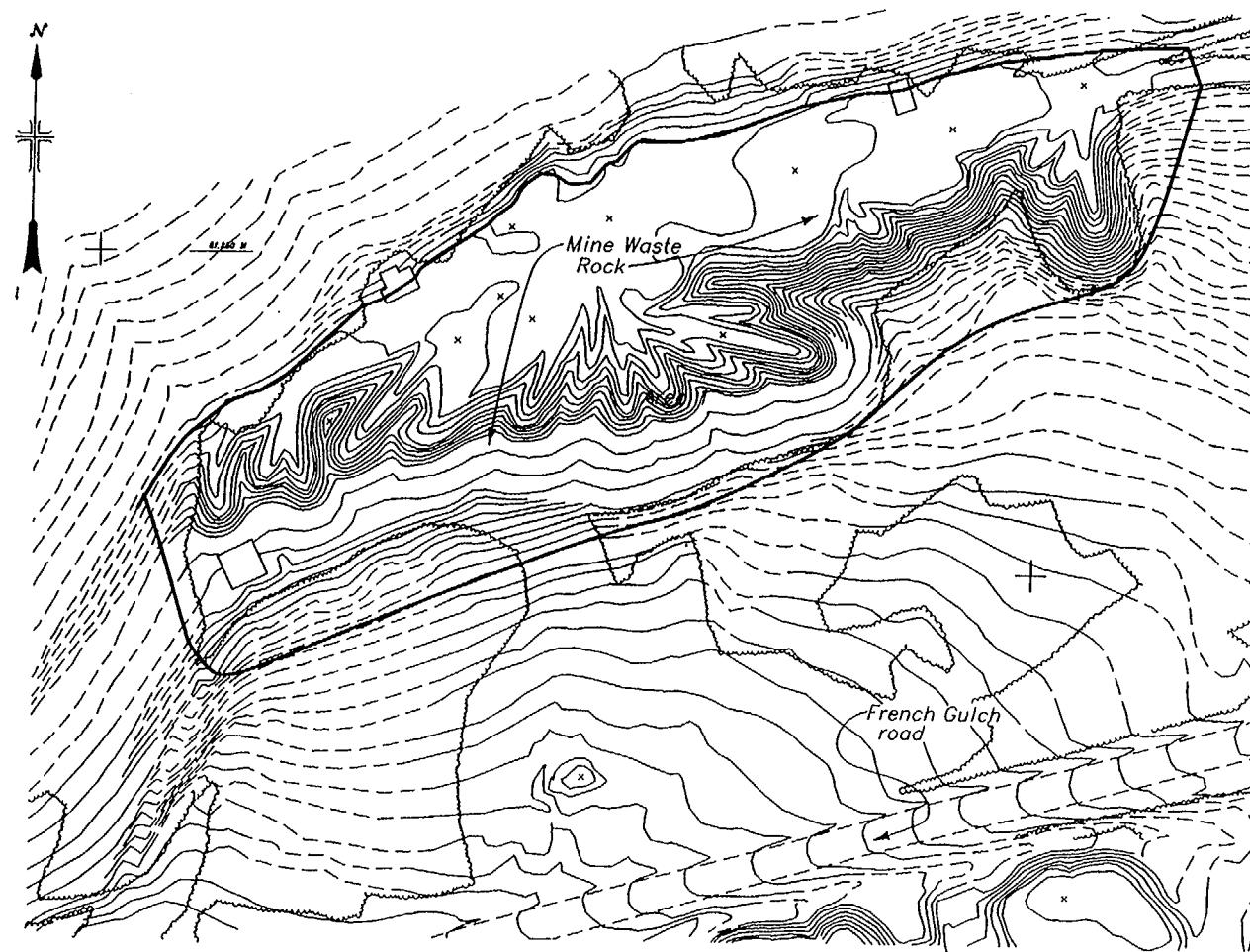
Surface Waste Wellington - Oro Mine and Mill Site



From USBR, 1997b

Figure 8-1

Surface Waste X.10.U.8 (Extenuate) Portal Site

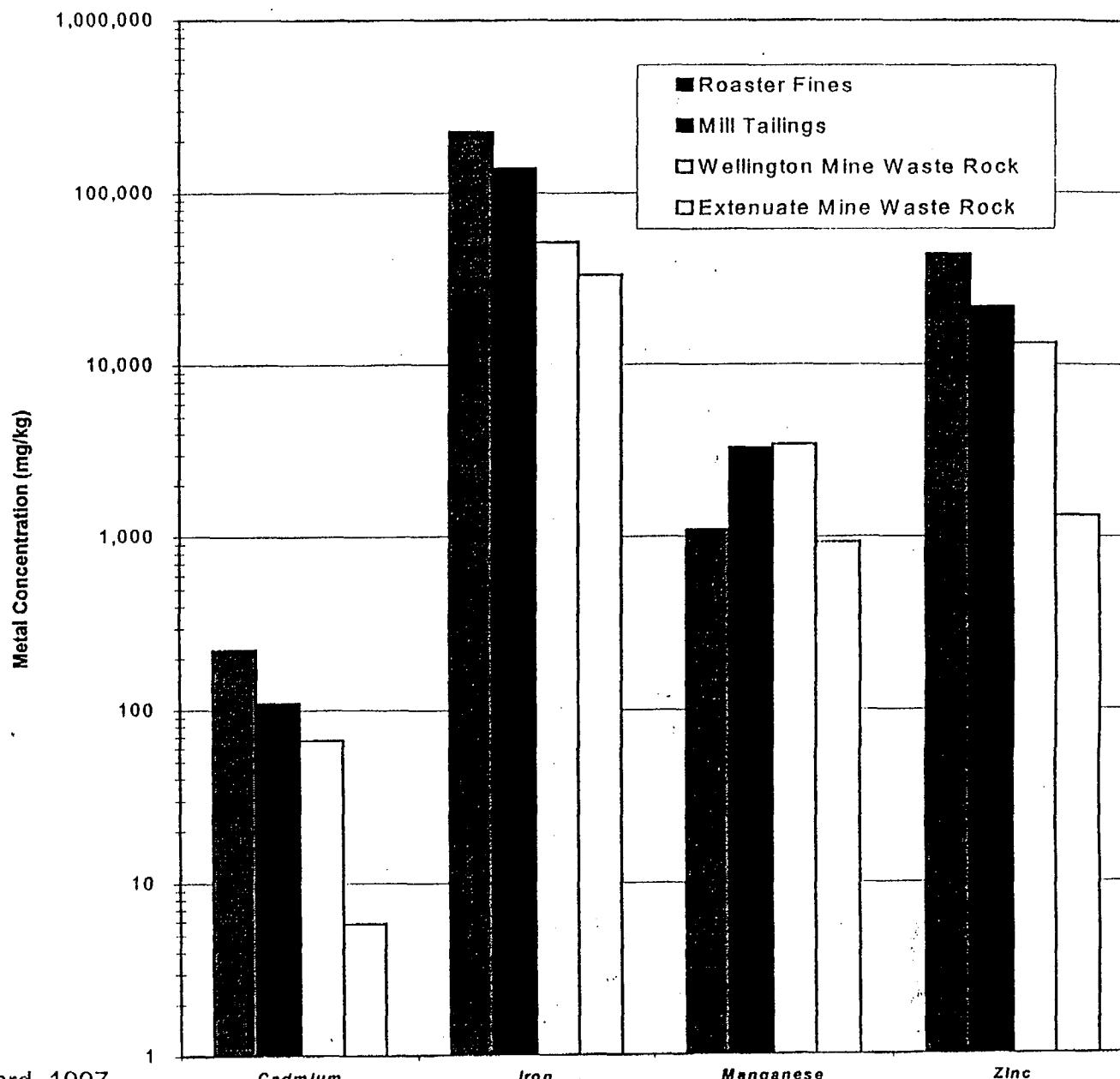


1 inch = 77 feet

From USBR, 1997b

Figure 8-2

Average Metal Content in Surface Waste



From Richard, 1997

Figure 8-3

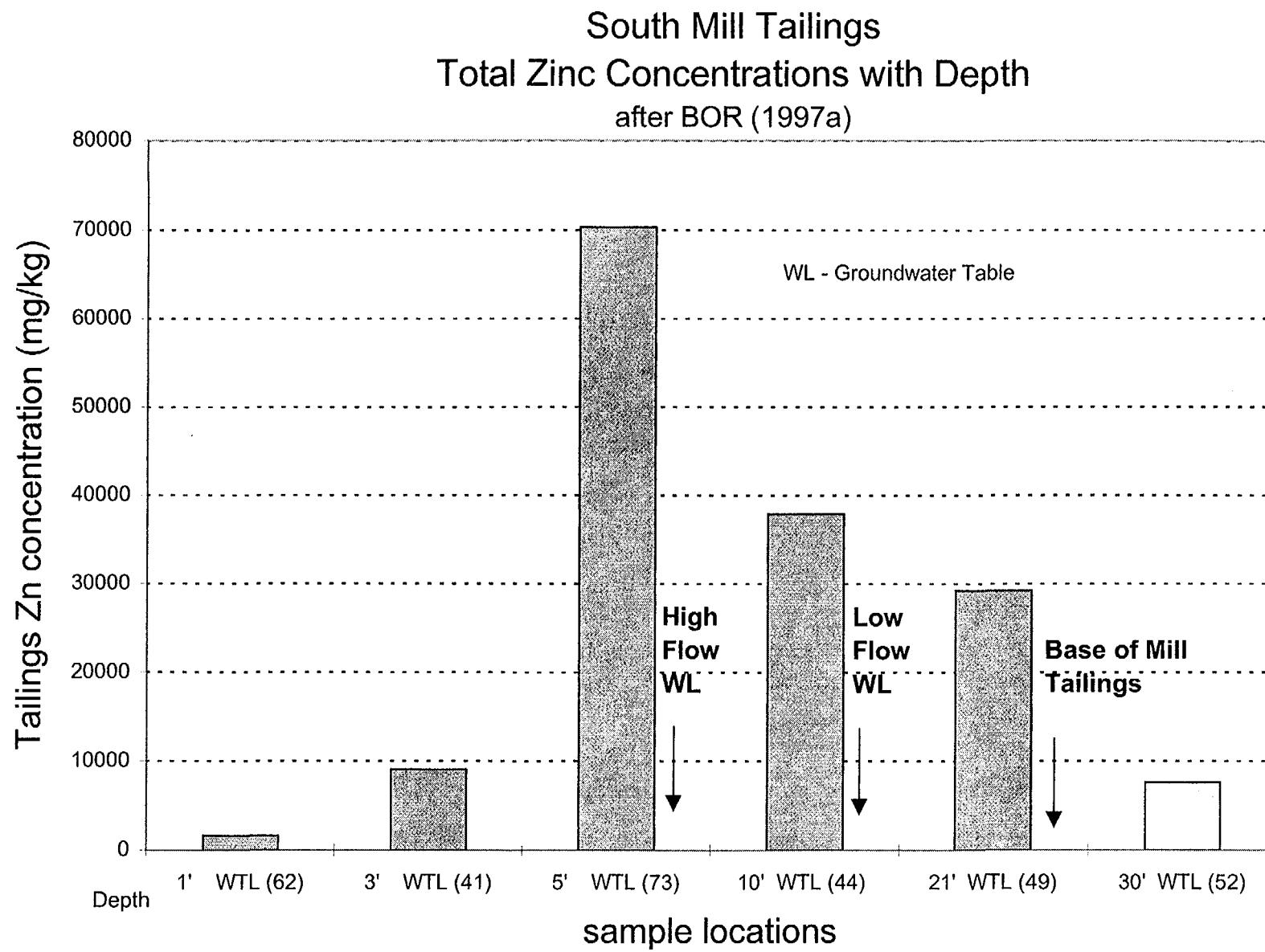


Figure 8-4a

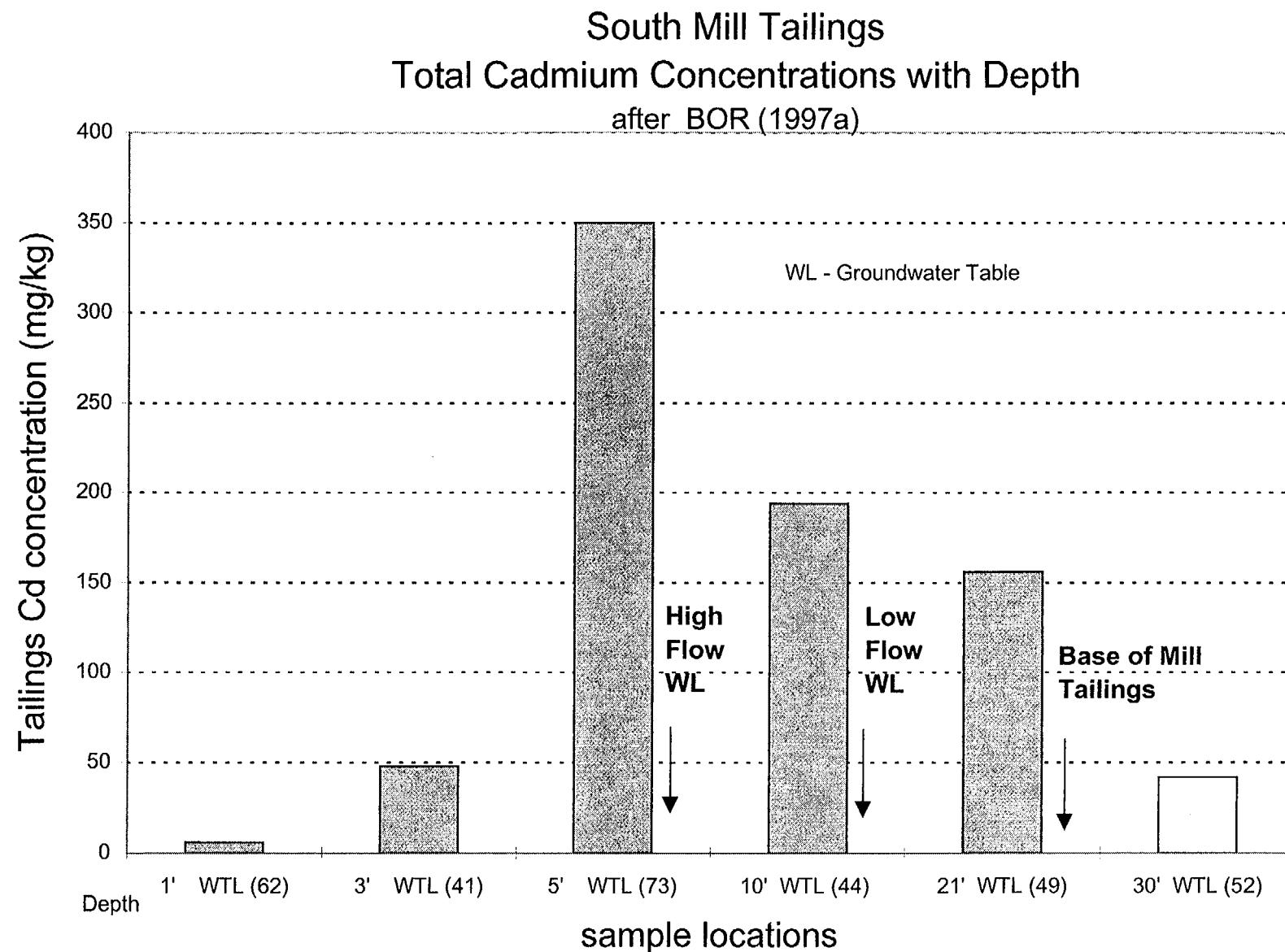


Figure 8-4b

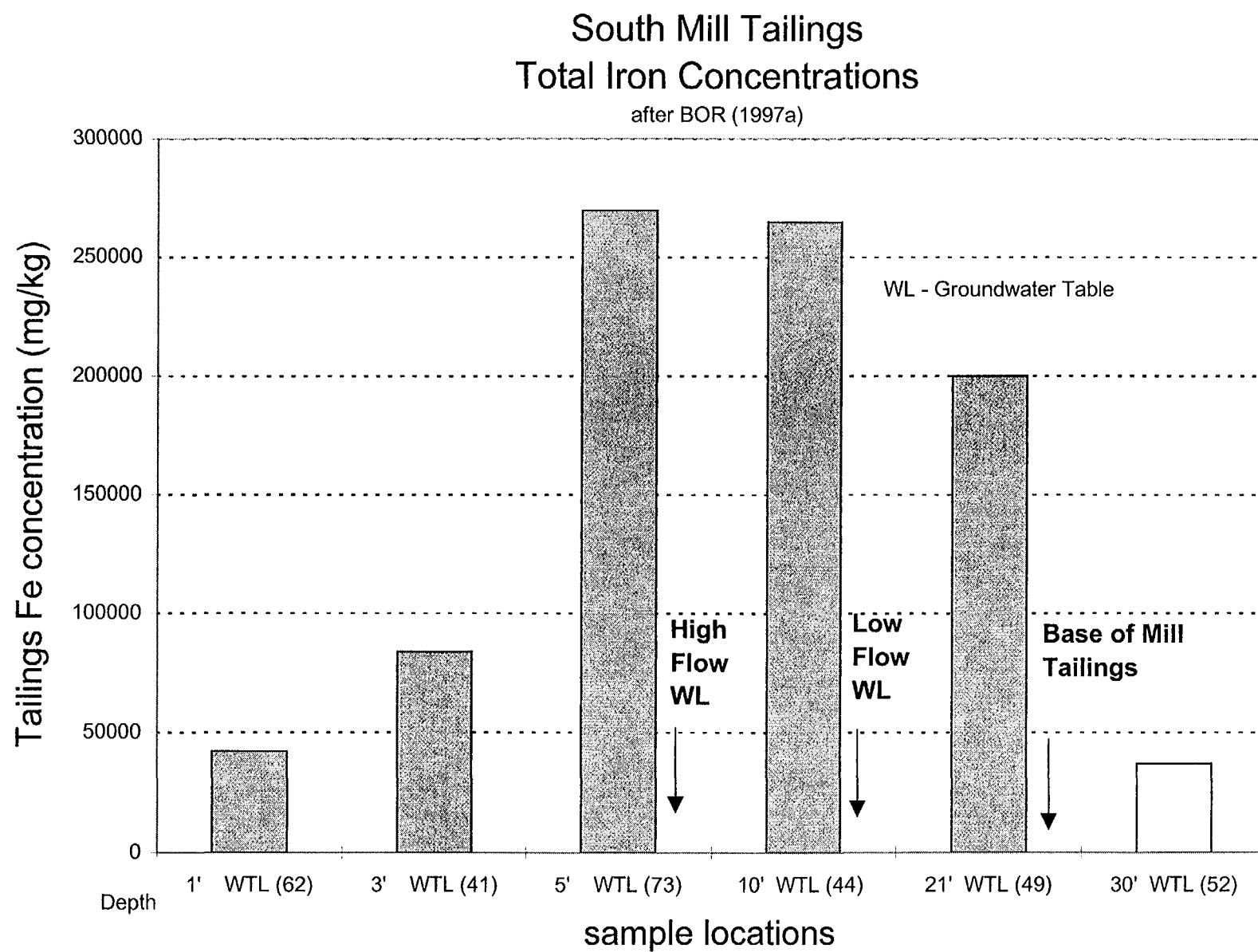


Figure 8-4c

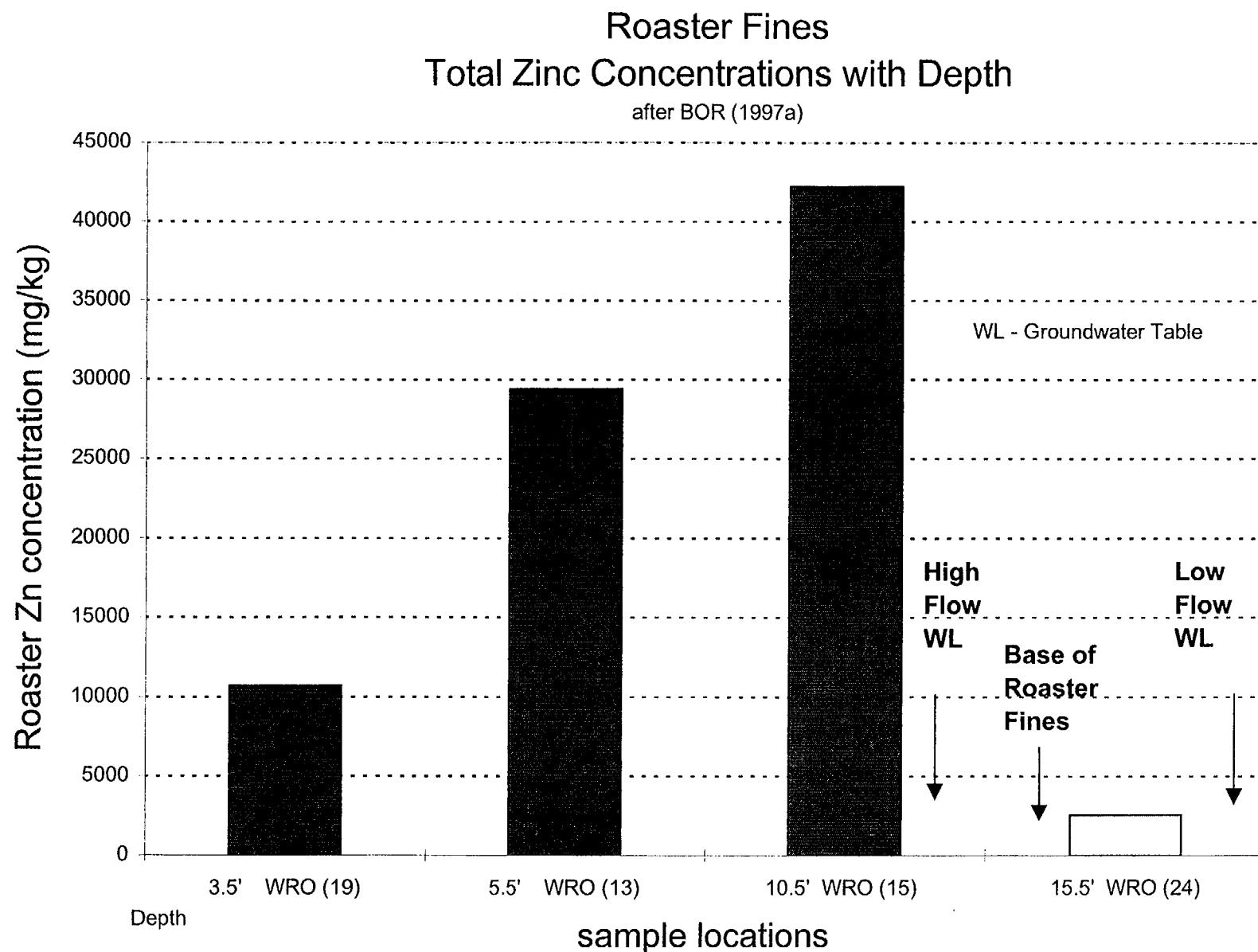


Figure 8-5a

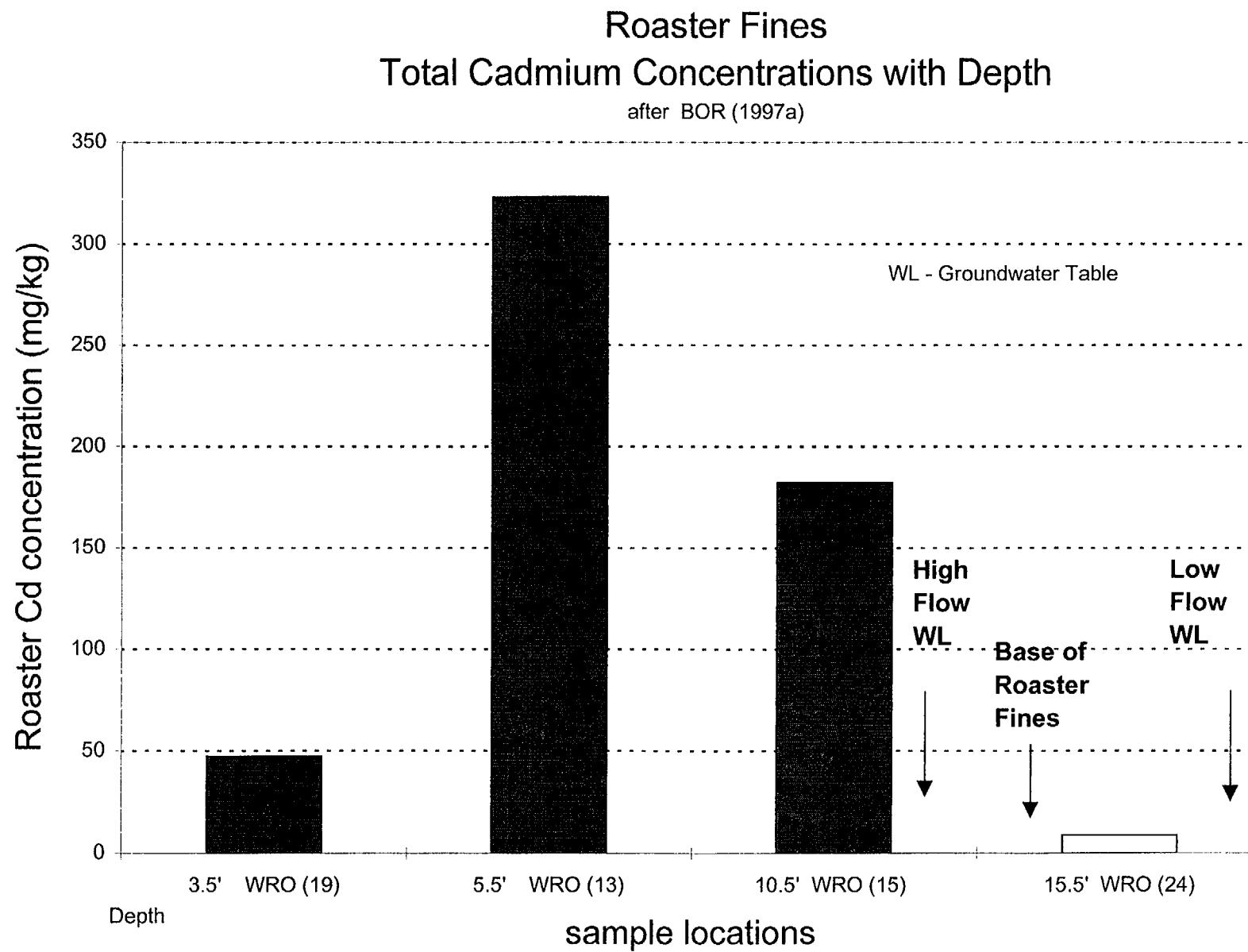


Figure 8-5b

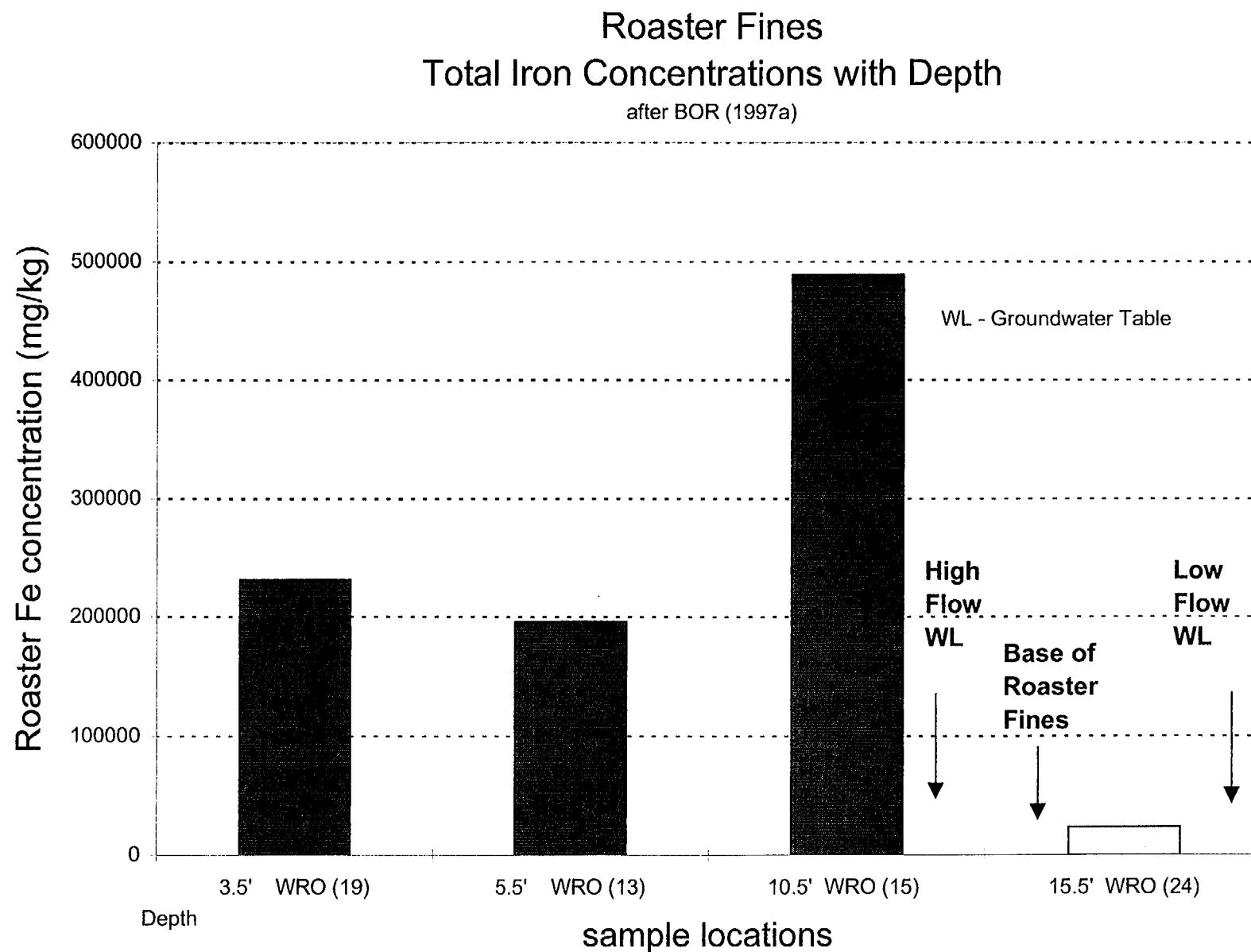


Figure 8-5c

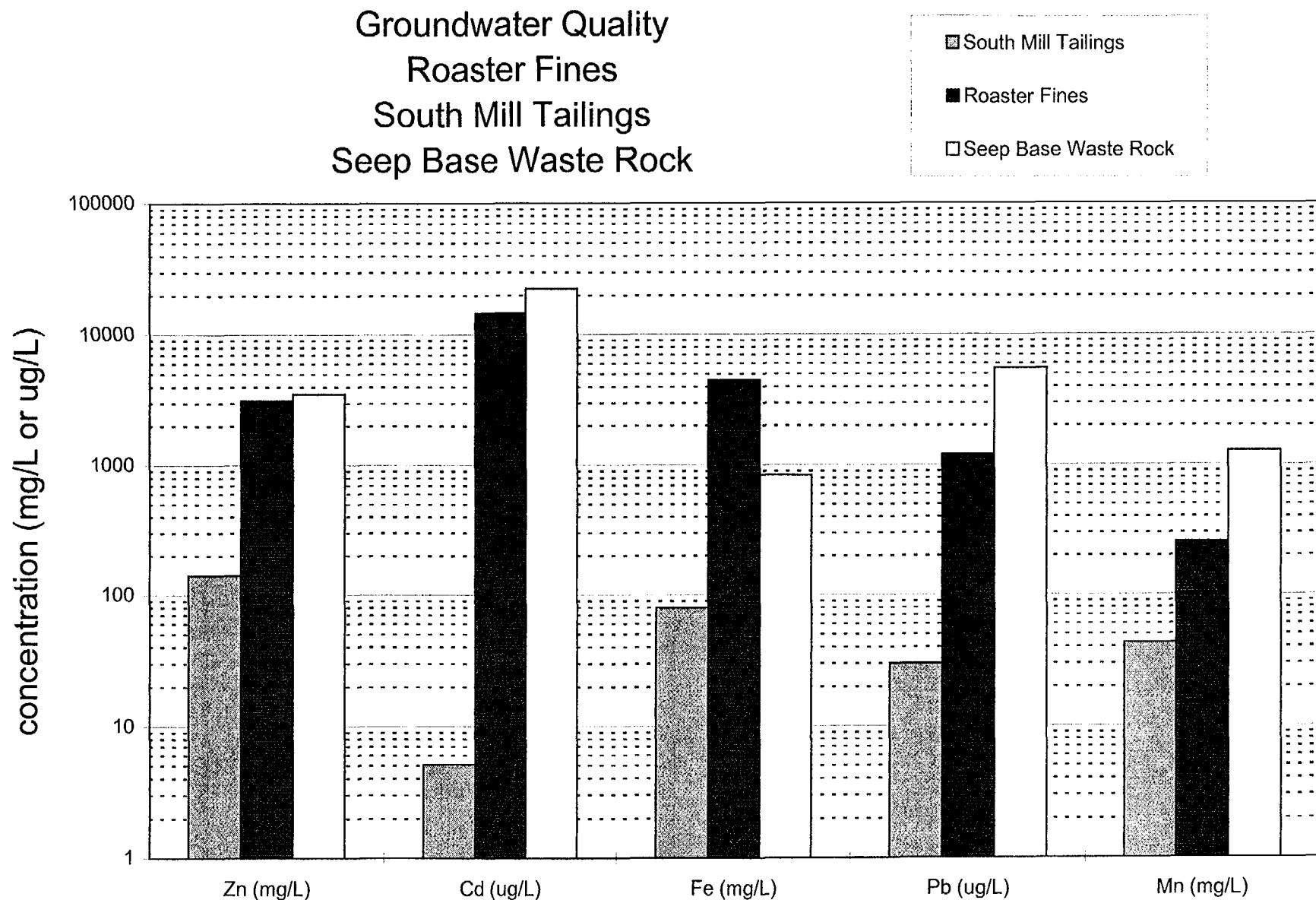
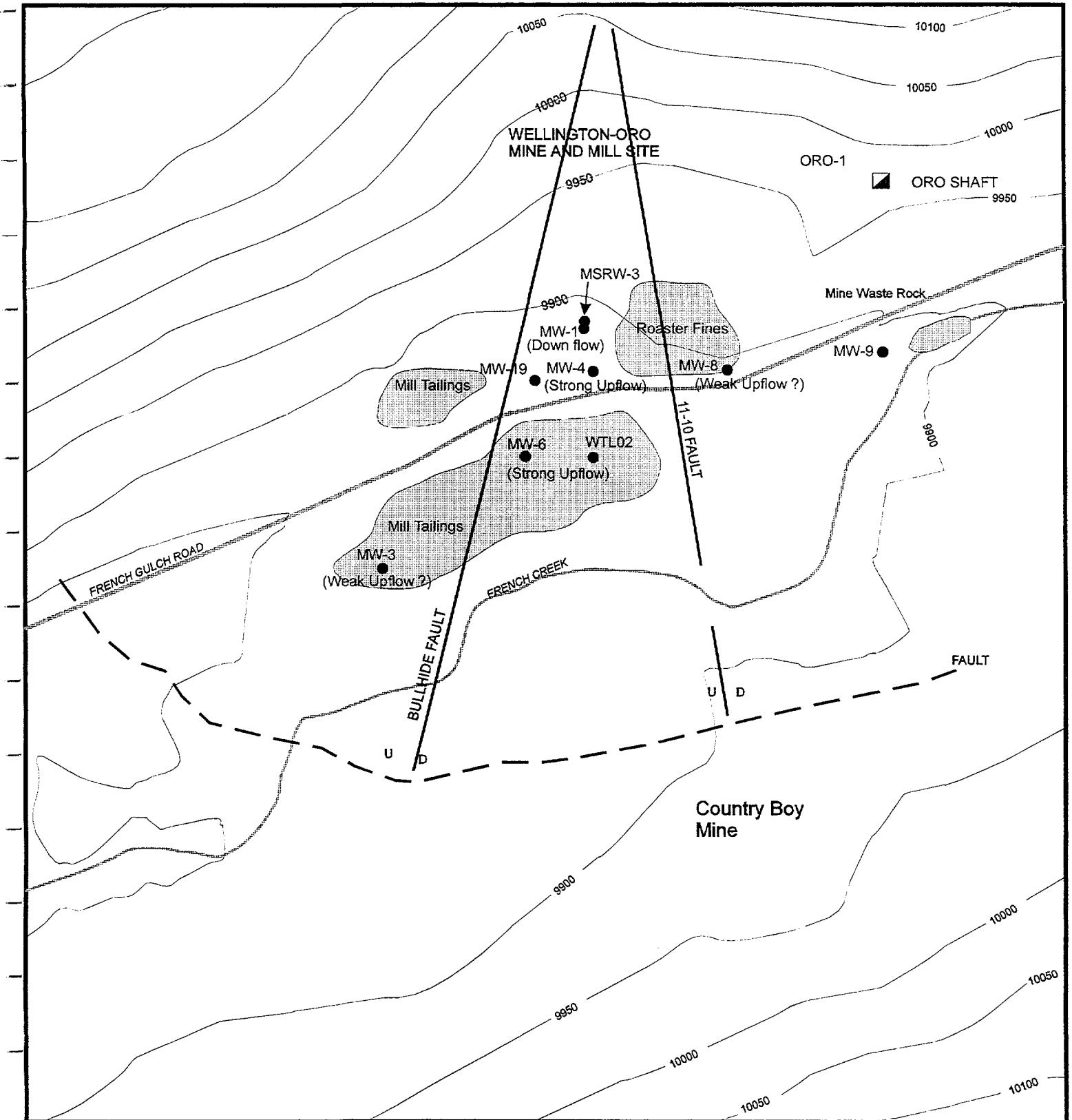


Figure 8-6



scale 1" = 250'

**LOCATION MAP FOR HEAT PULSE
FLOWMETER WELLS LOW FLOW
CONDITIONS, JANUARY 1997**

Figure 8-7